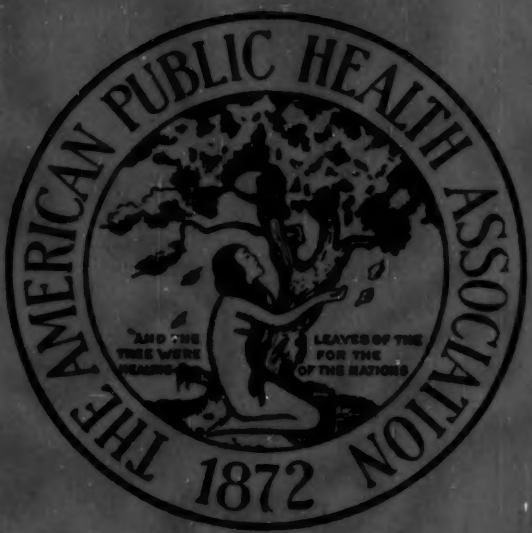
*American Journal of*

# PUBLIC HEALTH

*and The Nation's Health*




PREPARED IN TWO PARTS

PART I

The 83rd Annual Meeting
Kansas City, Mo.
Municipal Auditorium
November 14–18

MAY, 1955

volume 45

number 5

# VD...

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1. Smith, C. A., and others: Am. J. Syph., Gonor. & Ven. Dis. 38:136 (March) 1954. 2. Council on Pharmacy and Chemistry: New and Nonofficial Remedies. J. B. Lippincott Co., Philadelphia, 1954, p. 148.

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*American Journal of*

# PUBLIC HEALTH

*and the Nation's Health*

Official Monthly Publication of the American Public Health Association, Inc.

Volume 45 | May, 1955 | Number 5

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The American Journal of Public Health is published by the American Public Health Association, Inc., at 374 Broadway, Albany 7, N. Y. Executive office 1790 Broadway, New York 19, N. Y. Subscription price $10.00 per year for United States, Cuba and Mexico, South and Central America; $10.50 for Canada; and $11.00 for other countries. Single copies $1.00 postpaid. Entered as second-class matter at the Post Office at Albany, N. Y., September 17, 1932, under the Act of March 3, 1879. Published monthly. Copyright, 1955, by American Public Health Association, Inc. The American Journal of Public Health is indexed in the Industrial Arts Index and, in part, in the quarterly Cumulative Index Medicus, Biological Abstracts, Chemical Abstracts, Engineering Index, and Public Affairs Information Service.

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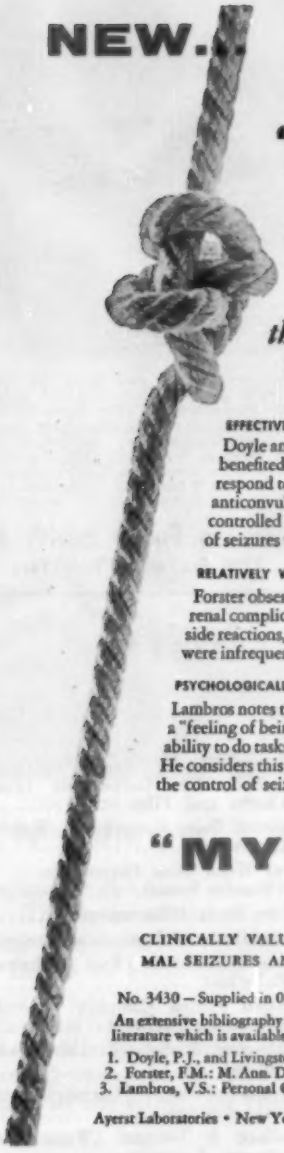

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1. Doyle, P.J., and Livingston, S.: J. Pediat. 43:413 (Oct.) 1953.
2. Forster, F.M.: M. Ann. District of Columbia 23:137 (Mar.) 1954.
3. Lambros, V.S.: Personal Communication.

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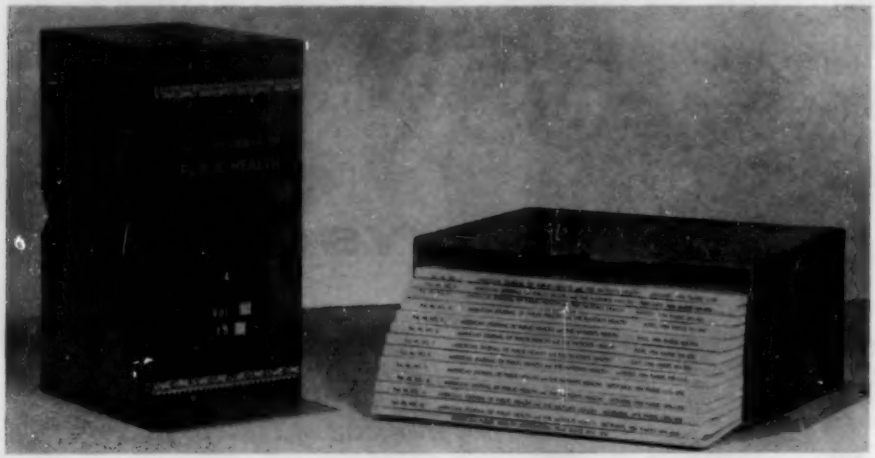

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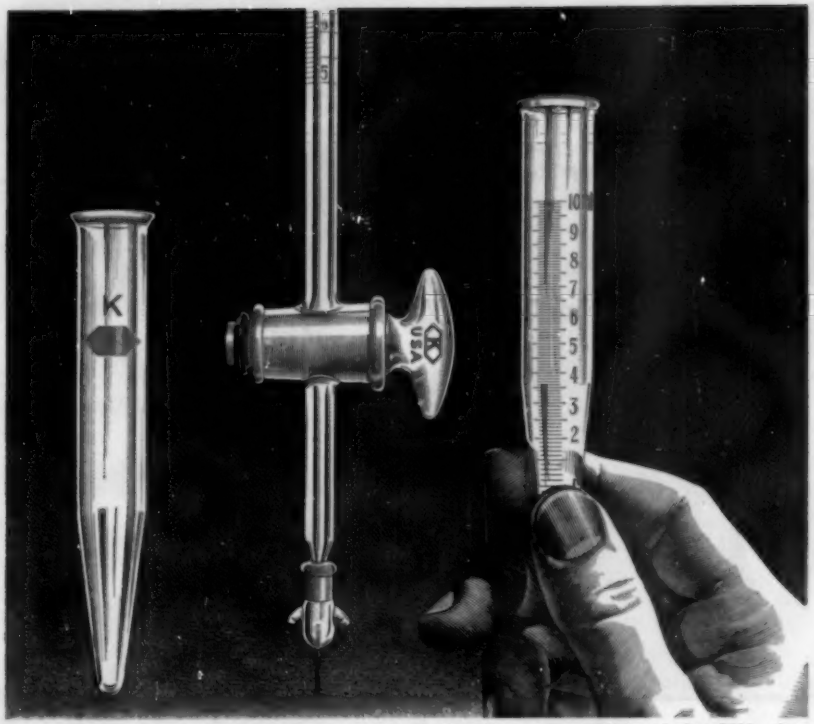


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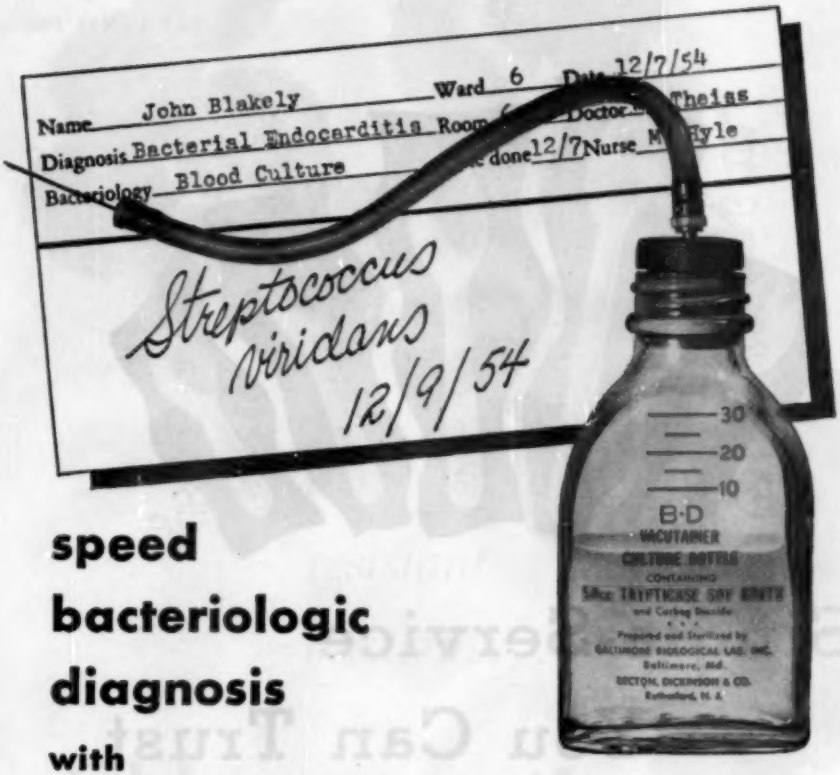


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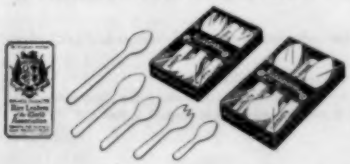

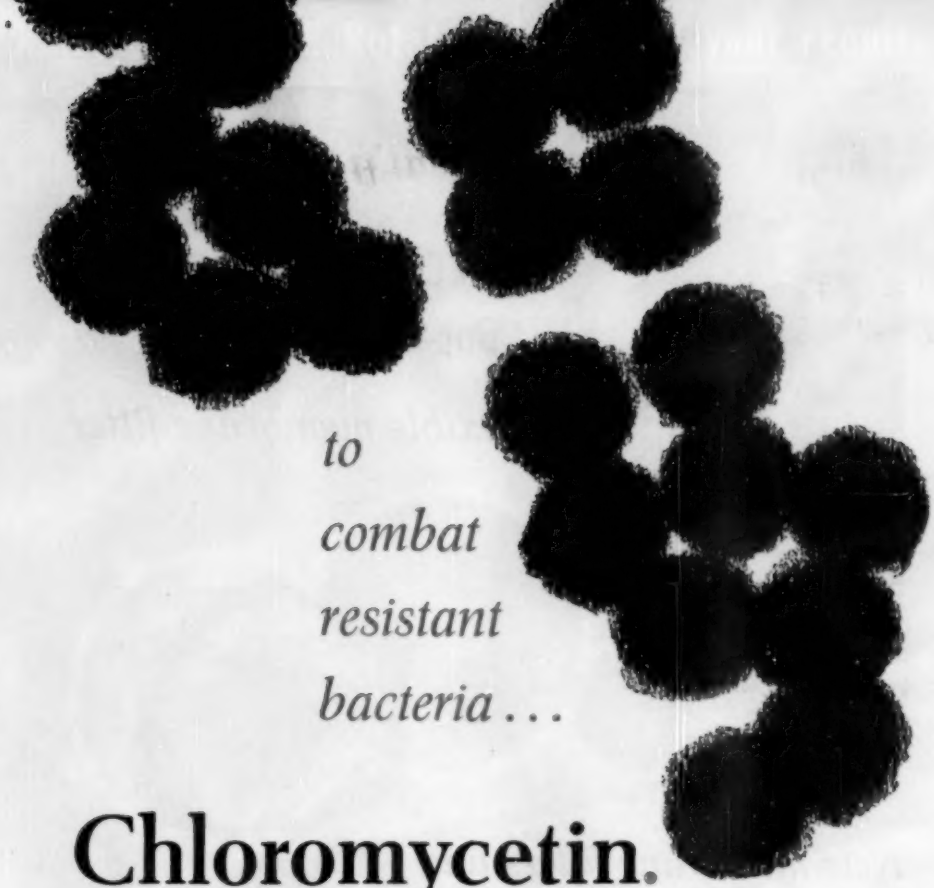

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*Pratt, R., & Dufrenoy, J.: Texas Rep. Biol. & Med. *12*:145, 1954.

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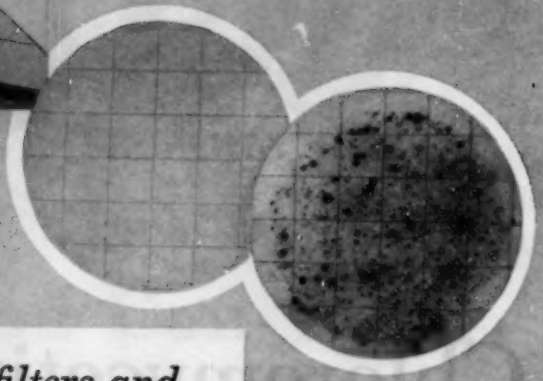

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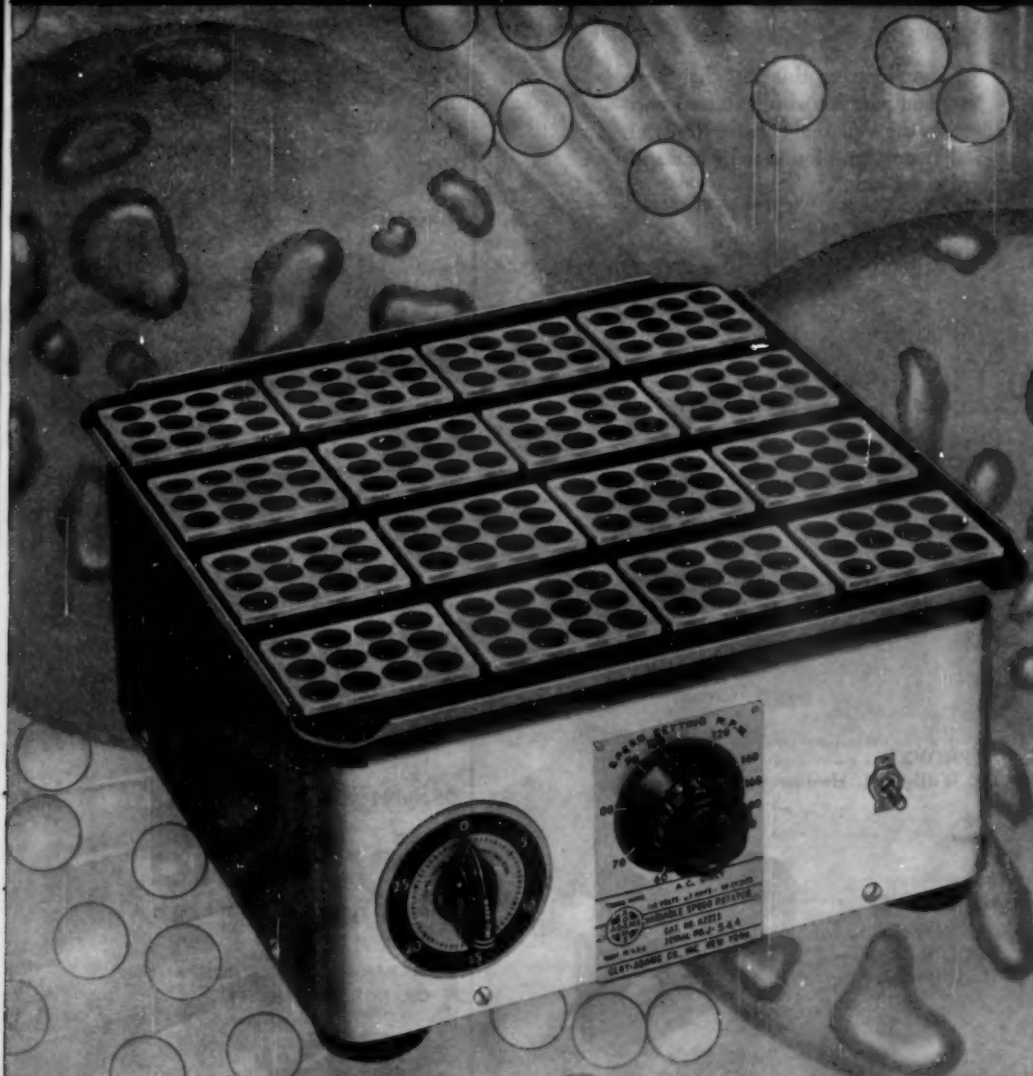

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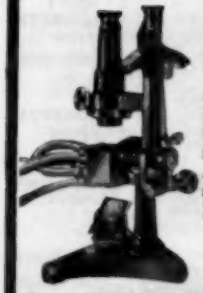

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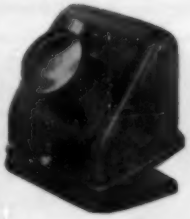

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1 *Klarmann, E. G.; Wright, E. S. and Shternov, V. A.: Prolongation of the antibacterial potential of disinfected surfaces, Applied Microbiology 1:19 (Jan.) 1953.*

2 *Smith, C. R.: Disinfectants for tuberculosis hygiene, Soap and Sanitary Chemicals 27:130 (Sept.) 1951; 27:145 (Oct.) 1951.*

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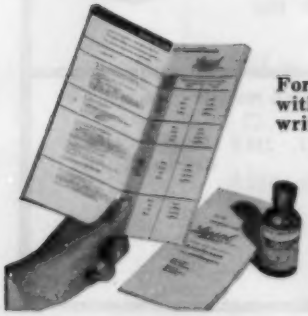

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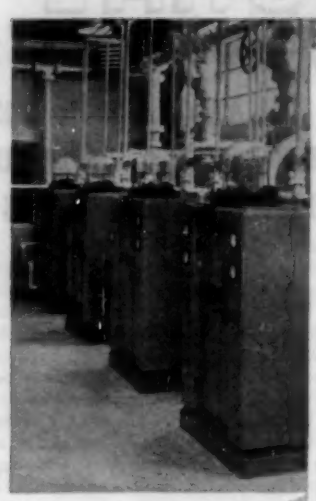

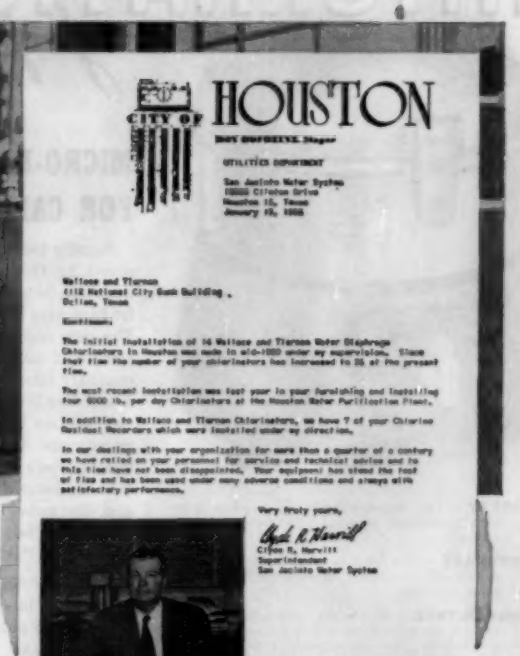

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Official Monthly Publication of the American Public Health Association, Inc.

Volume 45 May, 1955 Number 5

# Vaccination Against Paralytic Poliomyelitis
## Performance and Prospects

For the Staff of the Virus Research Laboratory by Jonas E. Salk, M.D., F.A.P.H.A.

*The studies upon which this report is based represent the joint efforts of many. That the product of their labors is greater than the sum of the individual contributions is the measure of the extra devotion for which there is no compensation save the satisfaction of doing what each enjoys most and can do best.*—JONAS E. SALK

***Here is evidence on which is based a newly recommended schedule of two-dose primary immunization against poliomyelitis.***

✠ In preparing a paper for presentation this morning (April 12, 1955) without prior knowledge of the details of Dr. Francis' report, it seemed best to orient the subject rather generally and let the evidence speak for itself.

### General Observations

To comprehend more easily the various questions concerned in relation to the whole, I would like to repeat the hypotheses that have guided our studies. Apart from the immediate question of the possibility of preventing paralytic poliomyelitis by immunologic means, there is the further issue, in the broader realms of the field of immunology, con-

Dr. Salk is research professor of bacteriology, Virus Research Laboratory, School of Medicine, University of Pittsburgh, Pittsburgh, Pa.

This paper was presented at a Convocation at Ann Arbor, Mich., April 12, 1955, under the auspices of the National Foundation for Infantile Paralysis and the University of Michigan. These studies were aided by a grant from the National Foundation for Infantile Paralysis and this report is published with the assistance of the National Foundation for Infantile Paralysis.

cerning the relative advantages of immunization with so-called living-virus vaccines as compared with killed-virus vaccines. We have approached these questions from the viewpoint that, in accordance with well established immunologic principles, it should be possible, using a killed-virus preparation, to reproduce the immunizing effect of the infectious process.

During the course of our work it has become quite clear that commonly accepted opinions that are not founded on quantitative observations can not be supported for long. Having conducted a number of exploratory experiments, it became evident that destruction of virus infectivity with retention of antigenicity and the reaction involved in the immunologic response were both governed by certain definable and unalterable laws. While in some respects the existence of such rigid laws imposed restrictions and limitations, they also helped define the degrees of freedom within which certain effects could be reproduced consistently.

I shall dwell lightly upon these considerations merely to emphasize that it is not gambling in which we have been engaged, but rather in pursuits in a field of science. It would hardly be fitting, or proper, to set in motion an activity so involved in itself, and involving so many people, if all that were to be gained was that on a given occasion the preparation of vaccine in a certain way and used in accordance with a certain schedule did or did not perform in the "hoped for" manner. Each succeeding experience is of value if it adds to our understanding, and if it provides the basis for reducing the number of variables to within the necessary range required for greatest effectiveness.

This is not the occasion upon which to bring forth the wealth of evidence that has clarified our understanding of the dynamics of the various processes involved (1) in the preparation of virus for vaccine, (2) in destruction of virus infectivity with retention of antigenicity, and (3) in the immunologic reaction that follows the injection of a vaccine. For completeness, however, I merely want to mention some of the primary considerations that are necessary for achieving a particular level of performance of a vaccine designed to prevent paralytic poliomyelitis.

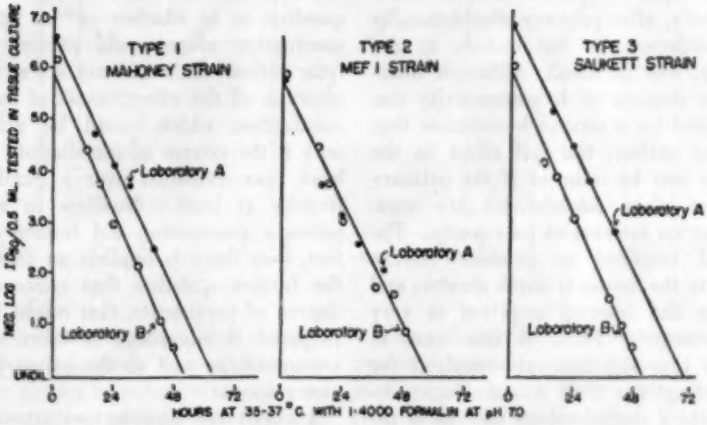
We have discussed in considerable detail elsewhere the principles involved in destruction of virus infectivity with formaldehyde; suffice it to say that this reaction appears to proceed as does a first-order chemical process (Figure 1). This makes possible the prediction, rather precisely, of the time required to render each preparation free of living virus. In still other experiments the rate of decline of antigenicity has been studied similarly and it has been established that the chemical treatment required for the preparation of vaccine does not reduce, in measurable degree, the antibody producing power of the virus unless overtreatment is extended for a period equal to more than five times that required to reduce infectivity beyond the point at which it is no longer measurable. With a margin of safety of this magnitude, both for destruction of infectivity and retention of antigenicity, it might be said that this aspect of the problem demands little, if any, further attention. Moreover, the vaccine prepared in this way is of such stability that no special precautions are required for its maintenance.

Perhaps the most interesting aspect of these investigations has been in the area of the antigenic behavior of the poliomyelitis viruses. Much has been learned that can be considered new knowledge, since in these various inquiries many of the properties and potentialities of the poliomyelitis viruses have been revealed and defined. For example, it has been shown that the quantity of virus, after conversion into the noninfectious form, required to in-

**Figure 1**

**Composite of Data on Rates of Destruction of Infectivity of Types 1, 2, and 3 Virus for 13 Lots of Vaccine Prepared by One Manufacturer and 20 Lots Prepared by Another**

Points Indicate Mean of Virus Titers at Intervals After Addition of Formalin to Warmed Fluids




duce an immune response in man is far less than might have been anticipated on the basis of comparisons with most other microbial antigens. Another point of interest is the observation that it is far easier to induce an immunologic response in man than it is in the monkey; the monkey, in turn, is more reactive in this respect than is the mouse. Thus, any preconception that may have existed that the quantity of antigen necessary to induce antibody formation in the mouse or in the monkey would have to be multiplied proportionately for the weight of a child seems not to apply; in fact, the relationship that does exist seems to be an inverse one.

You may see from this, therefore, that the recognition of the existence of these two immunologic facts both simplified and complicated the further pursuit of the problem before us. Simplification was provided by the recognition that the poliomyelitis virus was a much better antigen than had been believed and the complication introduced was in the recognition that valid answers, as applied to man, could not be had through the conduct of immunologic investigations in experimental animals. Quantitative immunologic studies had to be conducted first in man himself, after which tests in laboratory animals could be correlated and used for predicting probable antigenic performance in man.

In addition to the observation just cited, that it is easier to elicit antibody formation in man than in experimental animals, was the further demonstration that antibody persists for much longer periods of time in human subjects than in either the monkey or the mouse. Observations on the rate of decline of antibody induced by injection of killed vaccine into mice and monkeys would indeed make the prospects for a durable effect in man seem very dim; whereas, similar studies in human subjects present a much more hopeful prospect, indeed.

Other findings of interest are related to the length of the interval between primary and secondary stimulation, necessary to induce what is colloquially referred to as the "booster" effect. The length of the interval that must elapse for the hyperreactive mechanism to develop fully, after primary stimulation, is quite different in the mouse, in the monkey, and in man. Although intermediate degrees of hyperreactivity can be elicited by a second inoculation that is given earlier, the full effect in the monkey can be induced if the primary and secondary stimulations are separated by an interval of four weeks. The interval required to produce similar effects in the mouse is much shorter, and in man the interval required is very much longer. Thus, if one were to assume that the intervals required for completing the full immunologic response to a noninfectious vaccine is the same in man as in the experimental animals just cited, then the effects induced in man would have been incomplete and may have led to conclusions different from those to be drawn from our studies. As will be seen in a moment, the period required for the development of the hyperreactive state in man following primary antigenic stimulation seems to be a number of months rather than a period measured in weeks. The significance of these findings for utilizing the full potential of a vaccine has been amply confirmed, at least in so far as antibody measurement is concerned. These considerations have a very important bearing upon the question of persistence of vaccine effect, as well as upon the question of the most efficient utilization of a killed-virus vaccine.

Although almost all of these immunologic facts were appreciated before the initiation of the field test in the spring of 1954, not only from the accumulated experience in the broad field of immunology but as related specifically to the poliomyelitis virus, it was not possible to put this knowledge into practice because there was barely sufficient time before the onset of the seasonal upsurge to begin the studies then initiated. We might say, therefore, that the study conducted in the field in the spring and summer of 1954 was a test of the question as to whether or not primary vaccination alone could prevent paralytic poliomyelitis and not a test of the question of the effectiveness of full immunization which could be achieved only if the course of inoculations could have been extended over a number of months at least. Needless to say, if primary vaccination did induce an effect, then there is implicit an answer to the further question that concerns the degree of persistence that might be anticipated if advantage is taken of the secondary, as well as the primary, vaccine response.

I would like, now, to turn attention to questions of vaccine performance, before arriving at the point in the discussion that will deal with the prospects for prevention of paralytic poliomyelitis by vaccination.

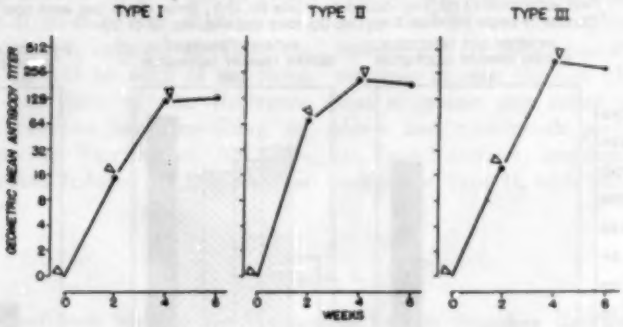
## Comparisons Between Vaccine Lots

Method of Study—Having reached the present state of knowledge of the requirements for preparation of a vaccine, it seemed desirable before proceeding further to study the performance of one particular vaccine against which all others could be compared. We proceeded, therefore, with the preparation of what we refer to as Reference Vaccine A to serve as a standard against which the vaccines used in the field tests were to be compared; this would be used, also, to help define the relative antigenic potency of vaccines that may be studied, or used, in the future. Figure 2 shows the kind of antibody response elicited by 1 ml of Reference Vaccine A, given intramuscularly, on each of three occasions separated by

**Figure 2**

**Geometric Mean Titers After Each of Three Doses of Reference Vaccine "A"**

1 ml., I.M., in 20 Subjects with No Preantibody to Any Type




intervals of two weeks. The subjects involved in this study were children in the early grades of school who, prior to inoculation, possessed no demonstrable serum antibody to either of the three virus types. It is clear from this chart that a sharp response occurred after the first dose, a further rise after the second, but little, if any, change occurred after the third when given at this point in time after the two preceding inoculations.

You will recall the similar experience reported a year ago, and shown again in Figure 3, where three doses at zero, two, and five weeks failed to induce more than a primary effect. However, in another study, the booster effect was induced upon reinoculation at an interval of seven months after primary vaccination. The latter effect is shown in Figure 4. It is apparent that the spacing of inoculations, to which reference has already been made, plays an important

**Figure 3**

**Primary Vaccination Effect**

Influence Upon Antibody Level of Each of Three Doses Spaced at Intervals of Two and Five Weeks After First Dose

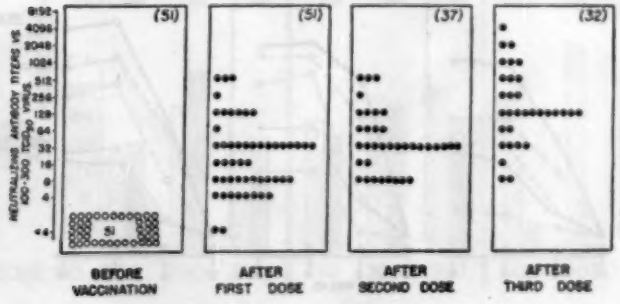
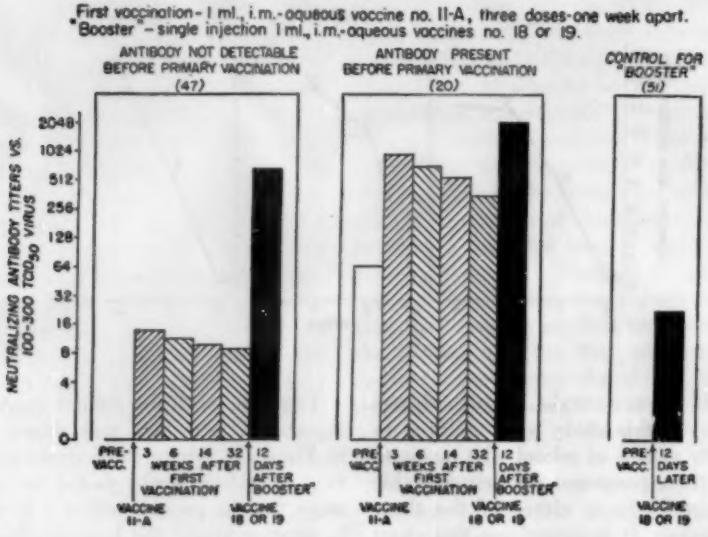


**Figure 4**

**Geometric Mean Antibody Titers Before and at Intervals Up to Seven Months After Primary Vaccination and After a "Booster" Injection (Composite of Data for Types 1, 2 and 3)**

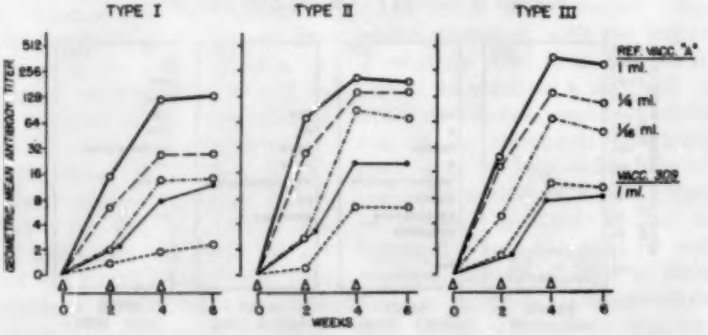



role in antibody response to vaccine; but, before we discuss this question in more detail, I should like first to shed further light on certain questions concerning the vaccine itself.

Figure 5 illustrates the importance of vaccine potency, or of vaccine dose, for inducing the primary effect. The degree of difference in antibody response elicited by three different concentrations

**Figure 5**

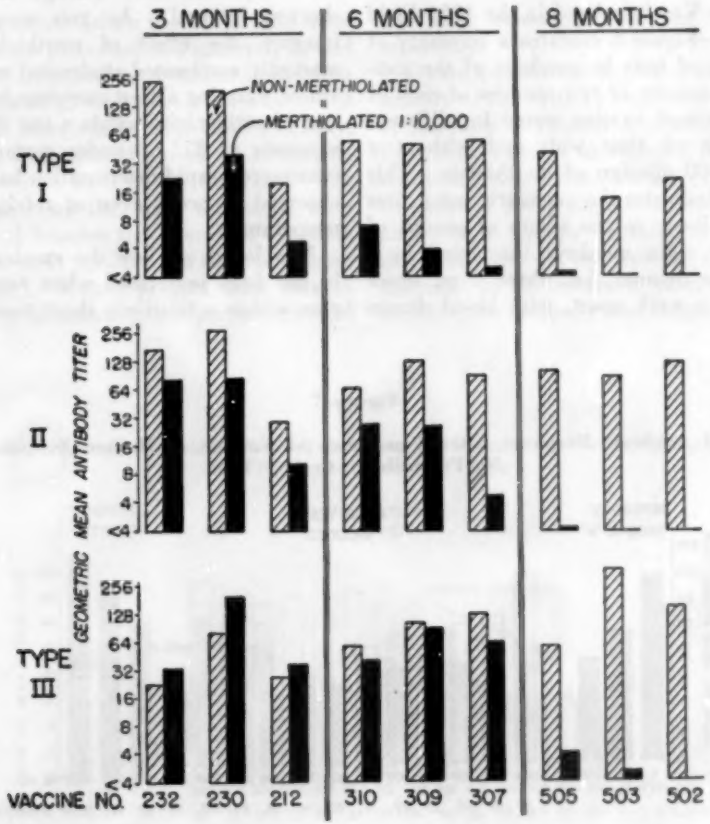
**Geometric Mean Titers After Each of Three Doses of Different Quantities of Reference Vaccine "A" and of Lot 309**



of Reference Vaccine A—namely, 1 ml, 1/4 ml, and 1/16 ml—are shown, along with a comparison of the response to 1 ml of one particular batch (Lot 309) of vaccine used in the field test in 1954. It is clear from these data that Vaccine Lot 309, as used, induced an effect less than that elicited by each of the three different quantities of the Reference Vaccine. The two lines describing the performance of Vaccine Lot 309 indicate the effect induced by this vaccine on two separate occasions; the first was approximately three months after the vaccine was prepared and the second approximately nine months after preparation. The continuous light line indicates the degree of response at three months and the dotted line the degree of response at nine months. It is evident that a greater gap exists between the three- and nine-month performance in the Type I antibody response; somewhat less in the Type II, with little, if any, in

**Figure 6**

**Relative Antigenic Stability for Monkeys of Vaccine Stored in Refrigerator for Approximately Three to Eight Months**



Type III. Without going into much more of an explanation at this point, I should like to say that these differences were due to the destructive effect upon the antigen of the merthiolate that was added to the finished vaccine to serve as a preservative to prevent the development of bacterial or mold contamination in the course of storage after manufacture or in the course of the use of a multiple dose vial. Even though the problem created by the relative instability of the vaccine in contact with this preservative has now been solved, I should like, before indicating to you the solution, to show how the merthiolate effect may have influenced the performance of the vaccine used in the field tests of 1954.

The Vaccines Used in the 1954 Field Tests—Figure 6 contains a summary of results of tests in monkeys of the antigenic activity of two samples of each of nine lots of vaccine stored for different periods of time with and without a 1:10,000 dilution of merthiolate. This chart indicates the geometric mean titer of antibody in the serum of groups of six to eight monkeys inoculated in a routine manner, i.e., three 1 ml doses given a week apart, with blood drawn one week after the last dose. Although variation among lots with respect to each of the three components, and between lots, is evident, it is the purpose of this chart to draw attention to the difference in antigenic activity between the merthiolated and the nonmerthiolated sample of the same batch. It should be clearly evident that much greater differences exist between merthiolated and nonmerthiolated samples in proportion to the length of storage. It is clear also that the effect begins to be evident earliest in the Type I component, next for the Type II, and last for the Type III. There appears to be no demonstrable difference between merthiolated and nonmerthiolated samples with respect to the Type III component after storage for the shortest interval. As you may well imagine, the effect of merthiolate is markedly accelerated at elevated temperatures, effecting almost complete destruction of antigenicity within a few days of exposure at 37° C; under certain circumstances, rapid deterioration has been observed to occur even at refrigerator temperatures.

Now let us see how the vaccine used in the field performed when tested in man within a relatively short time after

**Figure 7**

**Type I Antibody Response After Two Doses of Vaccine in Human Subjects with No Preantibody to Any Type**

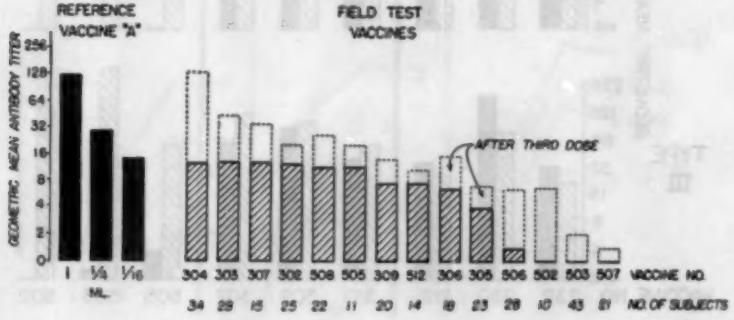
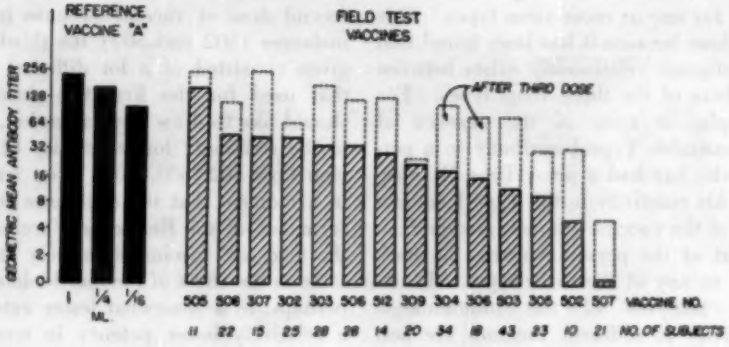


**Figure 8**

**Type II Antibody Response After Two Doses of Vaccine in Human Subjects with No Preantibody to Any Type**

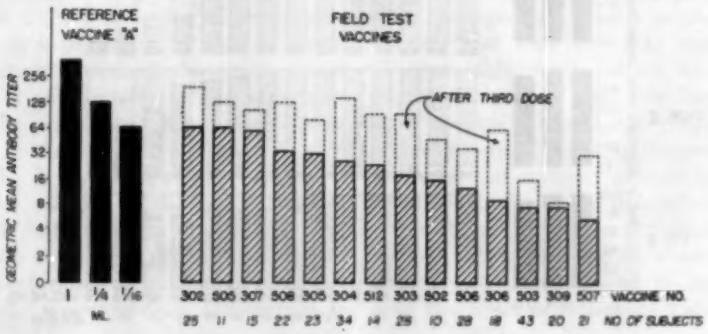



preparation, before use in the field tests. The data presented in Figures 7, 8, and 9 were obtained from studies in children in Pittsburgh who were inoculated at the end of March or in early April and May, 1954, with each of almost all of the lots of vaccines used in the field test. The few vaccines that were not tested were omitted because they were not available at this early period when these tests were initiated. I shall present these data to you by illustrating the performance of the three components of the vaccine separately.

Figure 7 shows the degree of antigenic activity of the Type I component of each of these lots of vaccine in relation to the Reference Vaccine to which I have already referred. These data are expressed in terms of the geometric mean titer of antibody in groups of subjects of the size indicated at the bottom of each column. In all instances, prior to vaccination, no antibody was demonstrable

**Figure 9**

**Type III Antibody Response After Two Doses of Vaccine in Human Subjects with No Preantibody to Any Type**



for any type. Many other individuals were included in these tests but are excluded from these analyses because, prior to vaccination, they possessed antibody for one or more virus types. This was done because it has been found that an antigenic relationship exists between members of the three virus types. For example, in spite of the absence of demonstrable Type I antibody in a person who has had a prior Type II infection, his reactivity to the Type I component of the vaccine is much greater than is that of the person who has no antibody to any of the three types. Therefore, analyses of the immunologic reactivity to different vaccines are best made by comparing the behavior of different vaccines in persons who have no demonstrable antibody to any of the three virus types.

The solid black bars at the left of the chart indicate the geometric mean levels of antibody induced by two doses of Reference Vaccine A when used in three different concentrations. The shaded columns indicate the degree of antigenic response elicited by two doses of the different field test vaccines employed. This comparison is made after the second dose of vaccine because in two instances (502 and 507) the third dose given consisted of a lot different from that used for the first two doses. I should like to draw your attention, first, to the strikingly lower activity of Vaccine Lots 502, 503, 507. You will see in a moment that the difference in performance of the Reference Vaccine and the field test vaccines is largely attributable to the effect of the merthiolate and, perhaps, to a somewhat lesser extent to a relatively lower potency in terms of virus content of the starting material (see Figures 12–14). Apart from any other considerations, there is the obvious fact that the field test vaccines differed in potency from one another and one could expect corresponding effects when tested in the field.

Figures 8 and 9 illustrate the performance of the Types II and III compo-

**Figure 10**

**Antibody Response in Human Subjects with No Antibody for Any Type Prior to Vaccination**

Per cent with Demonstrable Antibody After Two Doses Given Two Weeks Apart

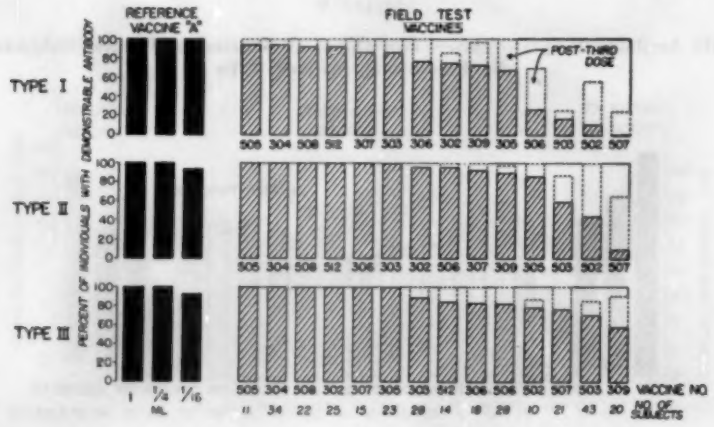
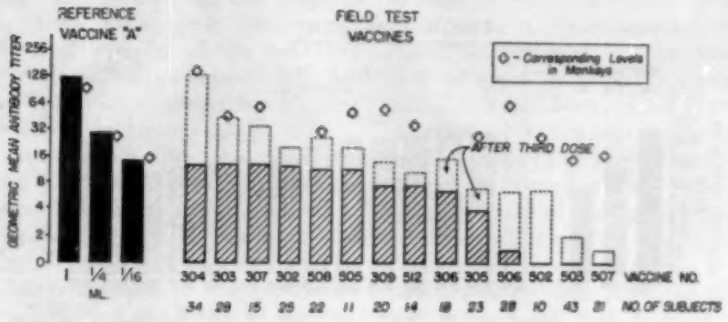


**Figure 11**

**Type I Antibody Response After Two Doses of Vaccine in Human Subjects with No Preantibody to Any Type**



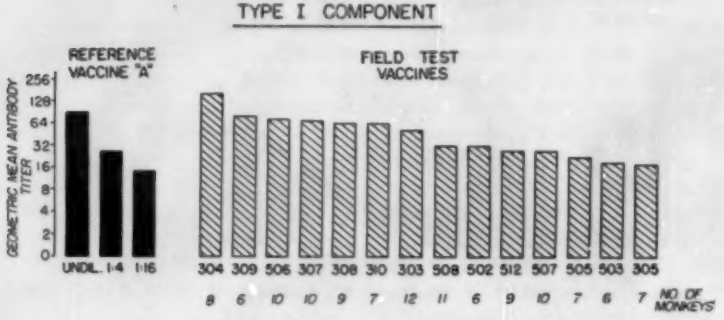

nents of the field test vaccines in relation to the corresponding components of Reference Vaccine A. The data are self-explanatory.

I have attempted to summarize somewhat differently in Figure 10 the data included in the three preceding figures. The data in Figure 10 are in terms of the percentage of individuals with demonstrable antibody after two doses of vaccine given two weeks apart. Demonstrable antibody is considered to be a titer level of 1:4 when measured against 100 $TCID_{50}$ of virus. The increase in proportion of individuals with demonstrable antibody after the third dose is indicated by the dotted extension of the shaded columns. The degree to which the different dilutions of Reference Vaccine A elicited formation of measurable antibody is shown by the black columns. This chart is particularly meaningful if there is any validity to the hypothesis that the presence of demonstrable antibody in the serum is sufficient to prevent the development of paralytic poliomyelitis. If this be so, then it is clear, indeed, that Vaccine Lots 507, 502, 503, and 506 would fall far short of satisfactory performance, at least for Type I paralytic poliomyelitis. Although it is clear that there is more to be desired with respect to the Type I components of the other lots of vaccine, as compared with Reference Vaccine A, their performance, nevertheless, is distinctly better than that of the four lots just mentioned. The points of interest are: that it does seem possible to prepare rather consistently vaccines that in a high proportion of instances do elicit antibody formation in man, and that the reasons are understood for the relatively poorer performance of the vaccines shown on the right hand side of the chart.

So that I may clear up the merthiolate question at this time, I would like to show a comparison between data obtained in monkeys, on the antigenic activity of the nonmerthiolated samples that corresponded to the merthiolated samples that were tested in man. To illustrate this point I have taken for Figure 11 a chart that you have just seen (Figure 7) and superimposed a series of points indicating the geometric mean titers of antibody induced by three 1 ml doses of nonmerthiolated vaccines given to monkeys at intervals of one week. It is interesting to observe that the geometric mean level of antibody after two doses of Reference Vaccine A,

**Figure 12**

**Relative Antigenic Potency for Monkeys of Field Test Vaccines in Comparison with Reference Vaccine "A"**

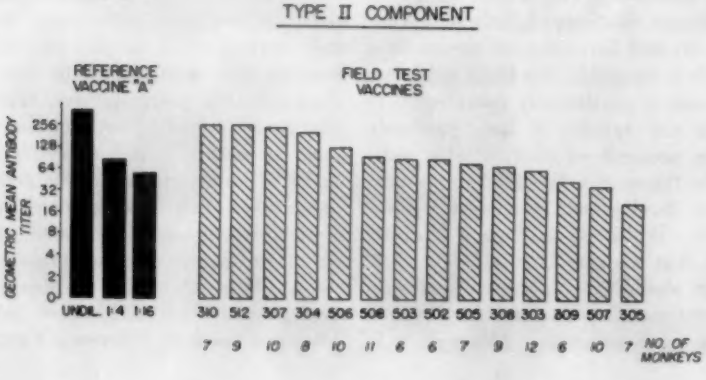



given two weeks apart, in man corresponds to the level observed in monkeys given three doses within the same interval of time; this is true even though the monkeys weighed 1/10 to 1/20 less than the human subjects. The comparability between the relative response to the three doses of the Reference Vaccine, both in man and in monkeys, is striking. You will recall the statement made earlier that man was more responsive than was the monkey, but you will note from Figure 11 that the monkey was more responsive than was man. This apparent paradox can be explained by the fact that the monkeys were given nonmerthiolated vaccine and man was given the merthiolated preparation.

The original potency tests in monkeys of vaccine used in man was done with

**Figure 13**

**Relative Antigenic Potency for Monkeys of Field Test Vaccines in Comparison with Reference Vaccine "A"**



merthiolated vaccines, and data on the nonmerthiolated preparations are drawn from studies on the stability of the merthiolated and nonmerthiolated preparations. Data on antigenic potency for monkeys of samples of the field test vaccines to which merthiolate was not added in relation to Reference Vaccine A are shown in Figures 12–14.

In the earliest tests the difference between the merthiolated and nonmerthiolated samples was not perceptible and, as was shown in a previous figure (Figure 6) the effect began to emerge with increasing time of storage. However, we did become aware of the low antigenic potency of the Type I component of Vaccine Lots 502, 503, and 507 some time before the third dose was given in the field test. The suggestion was then made that a third dose of more potent vaccine be used and this was done in some, but not all areas which were started with lots 502 and 507; no change was introduced, however, where lot 503 was used since this lot had been put up for the placebo test.

The final chart dealing with the merthiolate question is Figure 15 in which is illustrated the performance in man of a 1954 vaccine, lot 506, with and without merthiolate, tested when approximately two-months-old. The difference in antibody response elicited by each is clearly evident. In comparison, there is shown the performance of a 1955 vaccine to which a 1:10,000 dilution of merthiolate had been added but which, in addition, contained a quantity of versene sufficient to prevent the merthiolate from having a destructive effect upon the antigen; the antiseptic or preservative qualities of the merthiolate are still retained in such mixtures.

It should be clear from the findings just summarized that complete antigenicity of the formalinized vaccine, as we have described its preparation, can be retained for long periods of time at refrigerated temperatures (and for a number of weeks at 37° C) without demonstrable loss of antigenic activity. This has been true of the vaccine, per se, without an added preservative. However, it now appears that it is possible to retain the stability of the antigen while still retaining the advantages of the preservative by the addition of versene.

The solution of the merthiolate prob-

**Figure 14**

**Relative Antigenic Potency for Monkeys of Field Test Vaccines in Comparison with Reference Vaccine "A"**

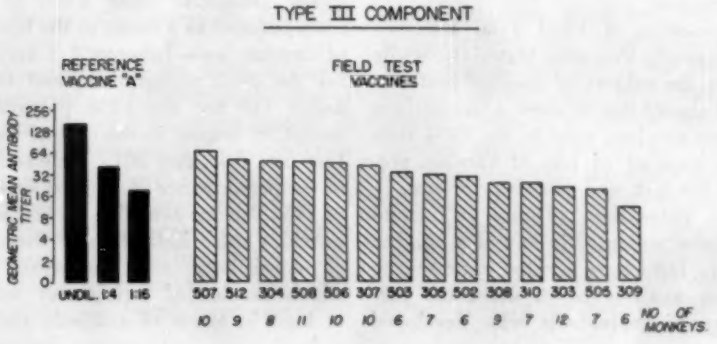
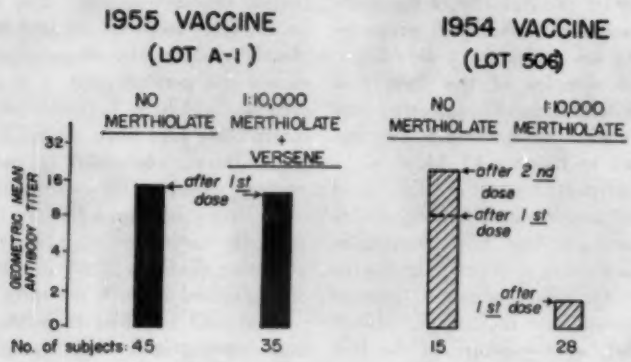


Figure 15

Type I Response to




lem by the addition of versene is the result of the efforts of the research staff at Eli Lilly and Company. Other laboratories, similarly engaged in vaccine production, are solving the preservative problem in a variety of ways, either by not using it at all, as is the case at the Connaught Research Laboratories in Canada and in certain European laboratories or by the use of other chemicals that can be shown to exercise the necessary antimicrobial effect without impairing antigenic activity. The requirement for a satisfactory preservative is that it not affect adversely the stability of the antigen, not only under normal conditions of storage, but under the more severe conditions of elevated temperatures.

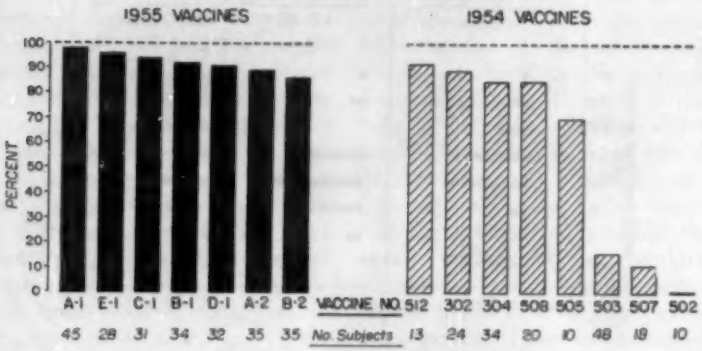
Comparison of Field Trial Vaccines with Recently Prepared Material—While still on the subject of vaccine performance I should like to show a comparison between vaccines used in the 1954 tests and a number of lots of vaccine prepared for test, and possibly for use, in 1955. These data (Figure 16) could have been presented in any of a number of ways, but I have selected to present to you an analysis based upon the percentage of individuals who developed clearly demonstrable antibody within 14 days after the first injection of vaccine. In all cases the individuals involved had no demonstrable antibody to any of the three types prior to vaccination, and all received 1 ml intramuscularly. These data show that the 1955 vaccines induced levels of antibody of 1:4 or greater in approximately 90 per cent or more of groups of the size indicated by the numbers at the bottom of the respective columns. By comparisor., vaccines used in the 1954 field tests exhibited a somewhat lower efficiency of conversion from negative to positive after the first dose, and the three lots to which attention has already been drawn were virtually nonreactive.

The geometric mean levels of antibody induced as a result of the first dose of vaccine were between 1:8 and 1:16 for the 1955 preparations and slightly under 1:8 for the 1954 preparations, except, of course, in the case of Vaccine Lots 502, 503, and 507. This summary of the performance of the first seven lots of 1955 vaccine available for test in man provides some indication of the degree of consistency and uniformity with which vaccine of satisfactory potency, at least in terms of antibody measure-

**Figure 16**

**Percentage of Children with Antibody Response (Type 1) on the Fourteenth Day After First Dose of Vaccine**

No Prior Demonstrable Antibody to Any Type




ments, can be prepared. It reveals, also, the effect of improvements that have resulted from the experience gained since a year ago. Six of the seven 1955 preparations contained no merthiolate and one contained merthiolate and versene.

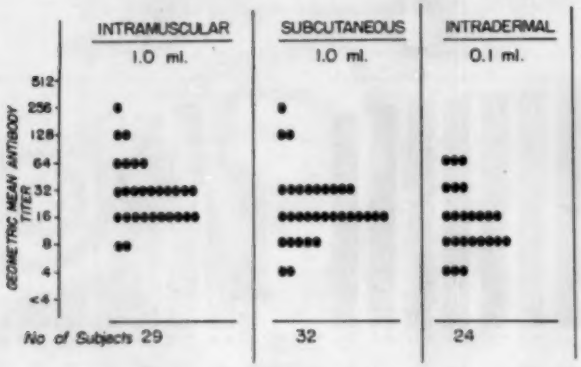
The other point that I wish to make, in presenting these data in this way, is to show the speed with which antibody formation is evident even after the first dose of vaccine. This is a question to which an answer is desired, and from other studies from which data are not being presented now we have found that following primary vaccination measurable antibody appears in some individuals sometime between the sixth and ninth day.

Comparison of First Dose Response Administered by Different Routes—I have just touched upon one aspect of vaccine performance that impinges upon that area dealing with the prospects for the control of the paralytic disease. If it is possible to create a measurable amount of antibody by the 14th day after first vaccination, it is conceivable that there would result a corresponding reduction in the probability of contracting paralytic poliomyelitis, if exposure occurs subsequent to the time when antibody is present in the serum in such concentration. Therefore, the use of vaccine for the first time during the poliomyelitis season, or even in epidemic areas, could be expected to have a beneficial effect so long as one keeps in mind the limitations imposed by the time required to induce the immunologic effect in relation to the time of exposure to infection.

Immediately the question that comes to the fore is the possible danger of inducing paralysis, especially involving the injected limb, if vaccine is administered at a time when any inoculation might induce the "provoking effect." Since Bodian has shown that the "provoking effect" can be induced in monkeys with a variety of substances injected intramuscularly, and since he has suggested that the effect might be somewhat less if injections are made by other routes, we made a study of the antibody response to vaccine given by three different routes. The data in Figure 17 show the levels of Type I anti-

Figure 17

**Type I Antibody Response in Children to First Dose Given by Different Routes of Reference Vaccine "A"**




body present on the 14th day after the first dose of vaccine which was given by three different routes. It was to be expected that the response to the intradermally injected vaccine would be somewhat less than to the vaccine given intramuscularly and subcutaneously, because the quantity administered was only 1/10 as much. However, when comparisons were made between corresponding amounts of antigen given intradermally and intramuscularly, it was found that the response to the first dose of vaccine was such that 0.1 ml intradermally produced an effect equivalent to that elicited by 0.25 ml given intramuscularly. It is of interest that the difference between intramuscular and subcutaneous routes is not very great, although the trend here observed is in favor of the intramuscular route. It was on the basis of observations of this kind, which have in other studies been more striking, that the intramuscular route was preferred over the subcutaneous route. In this study it was noted that the vaccine tended to leak from the puncture site when given subcutaneously, but when given intramuscularly this was not observed. It would seem from these data, therefore, that if there are any strong opinions against the administration of vaccine intramuscularly during the poliomyelitis season, there is some choice in the use of vaccine via other routes.

Observations on Persistence of Vaccine Effects—I should like to turn now to another aspect of vaccine performance that touches upon prospects for the control of the disease; this can be illustrated best by the data summarized in Figure 18. I have selected examples of two groups of individuals, each of which was given a different vaccine in the spring of 1954. Following the injection of Vaccine Lot 303 there occurred a rise in geometric mean level of antibody to all three types when three doses were given at zero, two, and five weeks. The levels after the second and third dose are shown, as well as the level prior to the booster injection which was given 10 months later. I would like to call your attention to the rather gradual decline in the geometric mean level of antibody after primary vaccination and the very sharp rise in antibody titer

following the booster dose. You will note that this was true for each of the three types in the group given Vaccine Lot 303 for the primary vaccination; the booster injection consisted of 1 ml of one of the 1955 vaccines.

In contrast children first inoculated with Vaccine Lot 507 and then again reinoculated 10 months later with a potent vaccine exhibited a booster response to the Type III component of the vaccine, a lesser response to Type II, and not a booster response but rather a primary response to the Type I component. That the response to the Type I component was primary is indicated by the comparability of the reaction observed in these children with that of another group given one dose of the vaccine for the first time; the latter group received the same lot employed for the booster. It should be clear from this that the level of antibody induced by the booster dose given 10 months after the primary vaccination was influenced by the intensity of the primary sensitization. The complete absence of Type I antigenic activity in Vaccine Lot 507 is reflected not only in the absence of an antibody response, but in the absence of the hyperreaction to a later dose of potent vaccine. Similarly, the lesser response to Type II in children vaccinated with 507 as compared with 303 was due to the poorer antigenic quality of the Type II component of Vaccine Lot 507. This reflects itself not only in fewer individuals exhibiting a booster effect, but in those who do, the degree of response is a lesser one.

I want to re-emphasize once again that the exaggerated reaction that occurs at the time of the secondary dose 10 months later could not have been elicited if this dose had been given very much earlier. From an extensive study, too detailed to present here at this time, it is possible to say that for elicitation of the full effect the booster injection should be given seven months, or later, after the first dose of vaccine. While it takes a number of months for a state of hyperreactivity, corresponding to that shown here, to develop, it now appears

**Figure 18**

**Effect of Booster Dose Ten Months After Vaccination with Two Different Vaccine Lots Used in 1954 Field Tests**

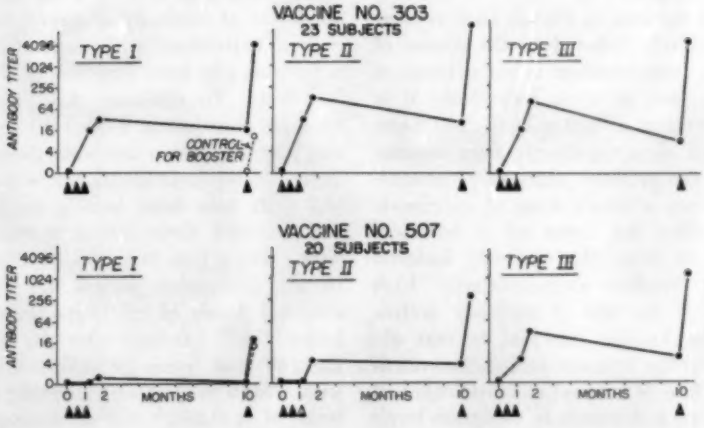
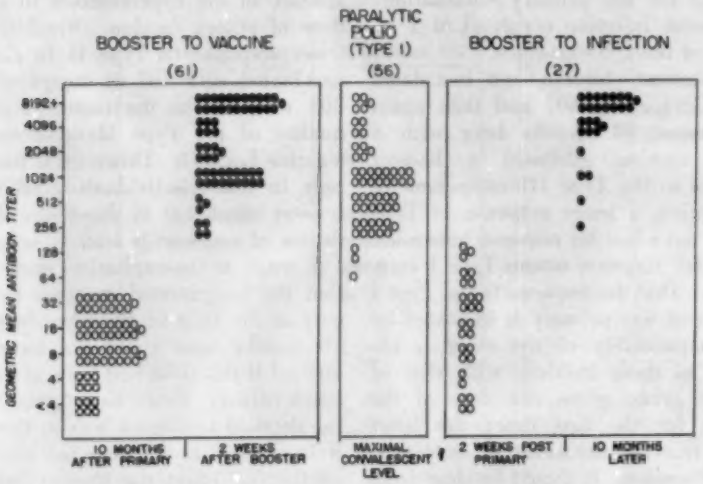


**Figure 19**

**Comparison of Antibody Response to Vaccination and to Infection**




that the hyperreactive state lasts for a considerable period of time. The longest interval over which we have had the opportunity to test for the persistence of the hyperreactive state has been two and one-half years after primary vaccination. Only time will permit a determination of the full extent to which the hyperreactive state persists following primary stimulation.

From the data in Figure 18 it is clear that antibody induced in the course of primary immunization is not evanescent and, in fact, in most individuals it is still present at a level only slightly lower than that observed shortly after completion of the primary phase of immunization; when a single dose of vaccine is given after the lapse of a sufficient period of time, the antibody induced thereby reaches extraordinarily high levels. If the rate of antibody decline after the booster is equal to that observed in the primary period, or even if the decline is somewhat more rapid at first, until it descends to moderate levels before the decline assumes a more gradual rate, it might be expected that antibody induced following such a course of vaccination would last for a considerable period of time.

## Antibody Response to Vaccination and Infection

As a matter of interest let us compare the levels of antibody observed in vaccinated individuals with those observed in persons who have experienced natural infection. To illustrate this point we have put together in Figure 19 the pre- and postvaccination antibody titers of a group of 61 individuals for whom we had such data from among those who had received their initial inoculations with Vaccine Lots 303, 305, 306, or 512. In the prebooster period the Type I antibody levels of all individuals were below 1:32; 14 days after the booster they all had levels beyond this range with a high proportion clustering at the level of 1:8,000+. For comparison,

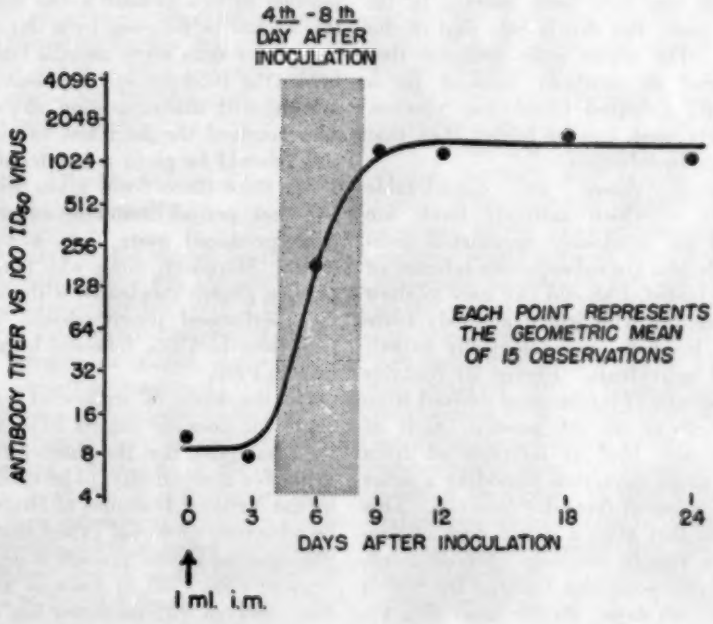
there is charted the levels of antibody observed in a group of 56 persons with Type I paralytic poliomyelitis and from whom serial bleedings were obtained at approximately weekly intervals while they were hospitalized. The geometric mean level of antibody was 1:128 at the time of hospital admission and shortly after onset of paralysis; there was no serologic evidence of prior infection with any other virus type. The antibody measurement recorded in Figure 19 was the highest observed in the series for each individual; the geometric mean level of the highest titers was slightly less than 1:1,024. From other experiences, it is to be expected that these high titers will decline over a period of time and will stabilize at a mean level of approximately 1:128.

It is evident from these data that there occurred, as a result of an infection with paralytic consequences, levels of antibody that in general were higher than that induced by primary vaccination with a killed vaccine. However, it is equally clear that the level of antibody induced with a killed vaccine, when a booster dose was given at a suitable interval, was higher than that induced by the infectious process.

In the right-hand portion of Figure 19 are data from another group that is of interest. These data are from a study of 27 children who had been vaccinated either in the spring of 1953 or the spring of 1954 and, in the course of follow-up bleedings in the winter of 1953 or 1954, respectively, it was evident that these children had experienced a natural in-

**Figure 20**

**Time of Appearance of Rise in Serum Antibody Titer in Human Subjects After Secondary Antigenic Stimulation**



fection. This was indicated by the sharp difference in the level of antibody for one type only when the early and late postvaccination blood samples were compared. In this group of 27 there are two children who had a Type III infection, diagnosed serologically; 12 had Type I infections and 13 had Type II infections. It is clear that the level of antibody observed in these subjects was, in general, higher than that observed in paralyzed convalescents. It is as if infection in a previously vaccinated person elicits a booster-type antibody response corresponding to the infecting type.

There is a similarity between the levels of antibody following a booster injection, and the postinfection levels in previously vaccinated individuals. The distribution of levels in each appear to be higher than that observed in recently paralyzed convalescents. It would seem from these data, therefore, that the assertion that the levels of antibody following the use of a killed-virus vaccine are lower than those observed in persons who have been infected is, indeed, true. But this is only part of the truth. The whole truth indicates that the level of antibody induced by a properly prepared killed-virus vaccine, properly used, can be higher than that induced by infection.

Having shown the considerable heights to which antibody levels are raised in previously vaccinated individuals who are subsequently infected or revaccinated, I should like now to show the rapidity with which antibody reappears in such immunologically experienced individuals. Figure 20 contains a composite of information derived from observations on 30 persons, each of whom was bled at intervals of from three to six days, thus providing a series of 15 points at three-day intervals. This reveals that after a single dose of vaccine a rise in antibody titer occurred, beginning sometime between the fourth and eighth days. By the latter time the maximum level appears to have been reached. Thus, we see as another expression of the hyperreactive mechanism the greater rapidity with which new antibody formation begins, as well as the augmentation of the amount of antibody that is induced.

## Practical Considerations

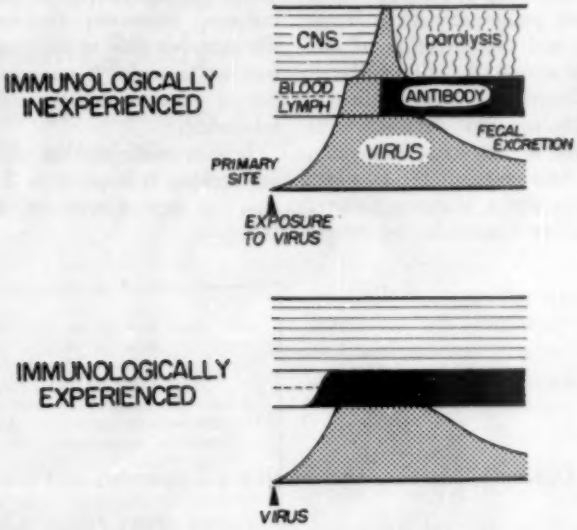
On the basis of all the evidence that has been gathered thus far, it would seem that antibody in the circulating blood could intercept virus invasion of the central nervous system. The question about which evidence is awaited is in regard to the level of antibody necessary for such an effect. This question should be answered, in part, by the field evaluation of vaccine effectiveness.

If the assumption is made that the presence of demonstrable antibody in the serum will be sufficient to produce the desired effect, I would then propose that for the year 1955 vaccine be administered in two doses, separated by an interval of two to four weeks and that this should be followed by a third dose, not earlier than seven months later, but before the 1956 poliomyelitis season. In keeping with this suggestion all children who received the field test vaccines in 1954 should be given a booster dose in 1955, since three doses given within a five-week period cannot be expected to have produced more than a primary effect. Moreover, those who may have been in groups vaccinated with vaccines that performed poorly should receive two doses in 1955, followed by a third dose in 1956.

On the basis of studies of vaccines made for possible use in 1955 and on the assumption that the potency requirements for acceptability, to be established by the National Institutes of Health, will be adequate, we would expect that available vaccine should provide a degree of immunity in 1955 at least as good as that observed with the better lots of field

**Figure 21**

**Concept of Influence of Previous Immunologic Experience in the Prevention of Paralysis**




trial vaccine. The booster dose prior to the 1956 season can be expected to enhance immunity further and to be effective not only for 1956 but, very likely, for a period the full length of which is still to be determined.

## Concept of the Mechanism of the Persistence of Immunity

The question that cannot be answered until sufficient time has elapsed is how long will immunity last. Will it last only so long as antibody is present in the blood stream or might immunity be more persistent than that? It would appear from the observations here reported that if vaccination induces a long-lasting alteration in the state of reactivity of the immunologic mechanism, then subsequent contact with the poliomyelitis viruses under natural circumstances should cause antibody formation to begin sufficiently rapidly and might be expected thereby to increase the likelihood that long-lasting immunity will follow the proper use of a properly constituted vaccine.

The foregoing hypothesis is illustrated graphically in Figure 21. The concept here illustrated suggests that even though antibody may not be demonstrable in the serum at the time of virus invasion, that a prior immunologic experience would have so primed the immunologic mechanism that antibody in good concentration would appear in the serum within a short time after the initiation of multiplication of virus at the portal of entry. If such antibody development occurs prior to invasion of the blood stream and is present in sufficient concentration to prevent systemic invasion, then access of virus to the central nervous system would be intercepted.

I am not unmindful that the thesis that has just been proposed may not be acceptable to all. I do not propose it

because of any concern lest a killed vaccine fail to induce and maintain the formation of respectable levels of antibody in the circulating blood. I propose this hypothesis principally to indicate our thinking, and the direction of our further investigations. I realize full well the practical limitations involved in trying to maintain immunity artificially if reimmunization is required frequently. This will be true particularly in older children and in adults, and especially at times and under circumstances where the disease against which one seeks to maintain immunity by artificial means is not highly prevalent. It is desirable, therefore, that means be developed for inducing immunity routinely in early life and for this to be done in such a way as to make it unnecessary for repeated treatments beyond the very minimum.

It may well be that the answer we are seeking is implicit in the knowledge that we now possess—time alone will tell.

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## Physicians, Dentists, Nurses, and Sanitary Engineers in Mobilization

A picture of the current status and predictions of the future status of health manpower in case of total mobilization is drawn in a pamphlet recently issued by the Health Resources Advisory Committee. This 49-page report to the director of the Office of Defense Mobilization entitled "Mobilization and Health Manpower" points out that expanding educational facilities to train health personnel, our national population growth, and the rising level of demands for health services will cause a continuing shortage of health personnel for many years. The committee recommends improved utilization of health personnel by both governmental and nongovernmental agencies to meet the national civilian and military manpower needs. It stresses the importance of building up the regular corps of career officers in the military health services.

The committee concludes that if mobilization should be increased substantially, either special legislation must be extended with the draft reaching veterans with the shortest period of prior service, or an alternate must be devised. If many more physicians and dentists were to be withdrawn to the Armed Forces, the protection of civilian health could become a matter of serious concern, particularly in view of a threat of attack on the civilian population.

# Public Health Aspects of the 1951 Impairment Study

## New Facts on Mortality of Insured Lives with Medical Impairments

EDWARD A. LEW, F.A.P.H.A., and HERBERT H. MARKS, F.A.P.H.A.

***It is usual for us to see only the immediate effects of our program activities. Rarely can we find out what happens in the long run. To the extent that investigations—such as the study reported upon—throw light on the long-range effects of different diseases and impairments, they become extremely helpful in evaluating programs, in estimating future public health needs, and in orienting ourselves and the public about the outlook for persons with medical impairments.***

Prognosis is of fundamental importance and interest in both medicine and public health. There are, however, relatively few accurate statistical studies of the long-range effects of various diseases. Even for tuberculosis the number of adequate long-range follow-up studies is small. Such investigations of syphilis, although more numerous, have generally been limited to relatively short-term studies of the effects of treatment. Most of the follow-up studies of patients with cancer likewise cover relatively short periods after diagnosis or treatment. The increasing public health interest in the fields of chronic disease and medical care has accentuated the need for long-range studies to determine prognosis. Such studies may be expected to shed light on the natural history of chronic diseases and the associated conditions which affect their course. More generally, such studies would furnish information for evaluating public health and medical care programs and for estimating future case loads, whether of chronic or other diseases.

The most abundant source of long-range follow-up studies lies in the medicoactuarial analyses of the experience among insured lives with various medical impairments, and more especially in the series of comprehensive studies in which a number of the large life insurance companies have cooperated. As was noted by one of us in a paper * published earlier, these investigations may be regarded as a classical example of long-range follow-up studies. The paper referred to contains a detailed review of their nature, characteristics, and limitations. Their salient features may be summarized:

The studies relate to persons insured

* Lew, Edward A. Insurance Mortality Investigations of Physical Impairments, A.J.P.H. 44, 5:641 (May), 1954.

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This paper was presented before a Joint Session of the American Association of Registration Executives and the Statistics Section of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 12, 1954.

under Ordinary life insurance policies (issued to individuals in amounts of $1,000 or more), either at standard or substandard premium rates. Such persons represent a highly selected sample of the population, having been drawn chiefly from white adult males in the middle- and well-to-do classes of the urban population. They have been "selected" on the basis of their acceptability for Ordinary life insurance. This presumes a reasonably good state of health when the insurance is issued.

Virtually all of the persons included in the studies were medically examined, in some cases more than once. A statement was invariably obtained as to the individual's medical history and body measurements, such as height, weight, etc. Furthermore, supplementary information concerning medical treatment was frequently obtained from the individual's physician. The results of the examinations have been generally reported not in diagnostic terms (e.g., rheumatic heart disease), but in terms of specific symptoms or findings (e.g., constant systolic murmur at the apex). It should be kept in mind, however, that examinations for life insurance are not as thorough as in clinical practice, and that the statements of an applicant for life insurance regarding his past medical history usually are not as complete or frank as those given to his private physician.

Life insurance studies of persons with specific medical impairments have usually been based on the observation of large numbers of individuals whose survivorship record can be accurately evaluated by reference to the contemporaneous experience among all persons to whom life insurance was issued at standard premium rates during the period covered by the study. The data represent the results of average medical care rather than care by selected specialists or clinical groups.

This paper deals with some of the more pertinent findings of the 1951 Impairment Study,* the recently completed intercompany investigation of insured lives with various medical impairments, made under the auspices of the Society of Actuaries. The study included the experience on some 625,000 persons, considered in 132 groups of medical impairments. They comprise a variety of disorders of the major body systems, as well as general and metabolic disorders. Among the more important groups of impairments investigated were heart murmurs, pulse abnormalities, family history of cardiovascular-renal diseases, epilepsy, psychoneurosis, pulmonary tuberculosis, asthma, gastric and duodenal ulcers, gallbladder disorders, albuminuria, glycosuria, hysterectomy, cancer, family history of cancer, and family history of diabetes. Many of these groups were subclassified according to degree of severity of the condition, type of treatment, time elapsed since attack or operation, or other pertinent factors. Cases with serious unrelated impairments or histories of disease were excluded in order to eliminate the extraneous effects they would have introduced. For most medical impairments the experience in this study was based on policies issued from 1935 through 1949, traced to policy anniversaries in 1950. While some persons in the experience were observed for as long as 15 years, the average period of observation was slightly over six years.

The results of the investigation have been presented in the form of mortality ratios which show the percentage of actual to expected deaths. This percentage relates the number of deaths that occurred among persons with a specific impairment to the number that would have occurred if their death rates had been the same (by age at issue and by duration of insurance) as those experi-

* "1951 Impairment Study." Compiled and published by the Society of Actuaries, 208 South La Salle St., Chicago 4, Ill., April, 1954.

**Table 1—1951 Impairment Study, Example of Detailed Tables Presented for Each Impairment Classification with 20 or More Policies Terminated by Death**

Apex murmur, systolic, constant, transmitted to the left, and/or mitral regurgitation, without hypertrophy, found on examination, not known to have had x-ray or fluoroscope for diagnosis

Substandard

Total Entrants, 18,877 Males, 77 Per cent Females, 23 Per cent

Experience by Age at Issue and Duration

| Ages at Issue | Exposed to Risk | Actual Deaths Policies | Actual Deaths Lives | Expected Deaths | Mortality Ratio Per cent | Policy Year Durations | Exposed to Risk | Actual Deaths Policies | Actual Deaths Lives | Expected Deaths | Mortality Ratio Per cent |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15–29 | 52,602 | 188 | 180 | 87.91 | 325 | 1– 2 | 33,406 | 123 | 122 | 51.93 | 237 |
| 30–39 | 35,784 | 178 | 170 | 78.27 | 227 | 3– 5 | 37,067 | 231 | 223 | 92.01 | 251 |
| 40–49 | 23,002 | 248 | 232 | 118.28 | 210 | 6–10 | 36,848 | 251 | 241 | 128.35 | 196 |
| 50–64 | 7,328 | 120 | 117 | 79.01 | 152 | 11–15 | 11,395 | 129 | 121 | 61.18 | 211 |
| 15–64 | 118,716 | 734 | 699 | 333.47 | 220 | 1–15 | 118,716 | 734 | 699 | 333.47 | 220 |

Experience by Cause of Death

| Cause of Death | Actual Deaths Policies | Actual Deaths Lives | Mortality Ratio Per cent | Cause of Death | Actual Deaths Policies | Actual Deaths Lives | Mortality Ratio Per cent |
|---|---|---|---|---|---|---|---|
| Tuberculosis | 14 | 12 | 197 | Digestive diseases | 17 | 16 | 83 |
| Malignant neoplasms | 81 | 75 | 153 | Nephritis | 27 | 26 | 388 |
| Vascular lesions of CNS | 28 | 27 | 201 | Accidents and homicides | 37 | 37 | 75 |
| Heart and circulatory diseases | 417 | 399 | 350 | Suicide | 7 | 7 | 46 |
| Pneumonia and influenza | 34 | 30 | 377 | | | | |

Note: Experience by cause of death given only for causes with 5 or more policies terminated by death.

enced by all persons insured under standard Ordinary policies during the same period. Corresponding mortality ratios have also been given for the major causes of death. An example of the format in which the results have been presented is given in Table 1 which shows the detailed figures for persons who on examination for life insurance were found to have a constant systolic murmur heard over the apex and transmitted to the left, but whose hearts were not enlarged. This was one of the largest impairment classifications in the study.

It should be noted that the basic mortality table representing the death rates by age at issue and duration of insurance under standard Ordinary policies covered both male and female lives. Because standard Ordinary policies have been issued preponderantly to males and because the mortality of female insured lives has been materially lower than that of male lives, the report also shows mortality ratios appropriately related to the experience of female insured lives for those impairments and conditions which are peculiar to females or for which the proportion of females was significantly higher than the average for all impairment groups.

In interpreting the results it is important to keep in mind that the death rates were quite low among lives insured under standard Ordinary policies during the period covered by the investigation. For example, even in the sixth to 10th policy years, the death rates were between one and slightly over two per 1,000 a year at issue ages under 35, and

also at about this level in the 11th to the 15th policy years at issue ages under 30. These death rates thus correspond to attained ages up to 45.

It should further be noted that during the period covered by the investigation, diseases of the heart and circulatory system came to dominate the mortality picture, followed by malignant neoplasms and accidents in that order. The death rates from tuberculosis, pneumonia and influenza, and nephritis were very low, so that a significant excess mortality from these causes showed up but infrequently and then only in impairment classifications with a large volume of material. For example, more than five expected deaths from tuberculosis or from pneumonia and influenza were found only in impairment classifications with more than 150 expected deaths from all causes.

This paper focuses attention on those impairments covered by the 1951 Impairment Study which are of special interest to the public health profession. Attention is given first to the conditions, largely of an acute or contagious nature, which have traditionally presented major public health problems. Consideration is then given to a number of chronic diseases which have been receiving increasing attention from public health departments.

Table 2 shows the mortality ratios for all ages combined, as well as other

**Table 2—1951 Impairment Study—Mortality Experience on Selected Impairments, Cases Insured in 1935–1949 Traced to the Policy Anniversary in 1950**

| Disease or Impairment; Interval Between Illness and Application | Class of Risk | Exposed to Risk (Policies) | Actual Deaths: Policies | Actual Deaths: Lives | Expected Deaths (Policies) | Mortality Ratio * (Policies) |
|---|---|---|---|---|---|---|
| | | | | | | Per cent |
| Pulmonary tuberculosis | | | | | | |
| 3–5 years | Substandard | 16,964 | 63 | 54 | 33.31 | 189 ± 16 |
| 6–10 years | Standard | 10,799 | 41 | 30 | 36.65 | 112 +14 −12 |
| | Substandard | 32,057 | 113 | 93 | 75.70 | 149 ± 9 |
| Over 10 years | Standard | 52,082 | 189 | 155 | 239.30 | 79 ± 4 |
| | Substandard | 20,655 | 88 | 77 | 60.96 | 144 ± 10 |
| Tuberculosis, coresidence [1] | | | | | | |
| At examination | Standard | 13,721 | 43 | 42 | 39.80 | 108 ± 11 |
| | Substandard | 26,198 | 71 | 70 | 54.15 | 131 ± 10 |
| Acute articular rheumatism (Ages 15–29 at issue) within 5 years | Standard and Substandard | 22,757 | 43 | 42 | 24.69 | 174 ± 18 |
| Apical systolic murmur, constant, with history of rheumatism or other streptococcal infection [2] | | | | | | |
| At examination | | | | | | |
| Without hypertrophy | Substandard | 48,691 | 294 | 243 | 111.33 | 264 ± 10 |
| Slight hypertrophy | Substandard | 5,530 | 45 | 42 | 12.05 | 373 ± 37 |
| Moderate hypertrophy | Substandard | 1,173 | 15 | 14 | 2.79 | 538 +125 −99 |
| Aortic systolic murmur, constant, without hypertrophy | | | | | | |
| At examination | | | | | | |
| Not transmitted | Substandard | 2,061 | 23 | 21 | 12.07 | 191 +34 −28 |
| Transmitted upward [3] | Substandard | 2,612 | 36 | 25 | 7.33 | 491 +67 −57 |
| Poliomyelitis (with marked deformity) | | | | | | |
| Any time | Standard | 33,770 | 68 | 55 | 67.65 | 101 ± 8 |
| | Substandard | 22,598 | 60 | 56 | 40.20 | 149 ± 13 |
| Syphilis, thorough treatment | | | | | | |
| Within 5 years | Substandard | 4,074 | 19 | 18 | 9.57 | 199 +40 −32 |
| 6–10 years | Substandard | 3,869 | 11 | 7 | 10.44 | 105 +30 −23 |
| Over 10 years | Substandard | 7,183 | 34 | 29 | 24.79 | 98 +14 −12 |

## Table 2 (continued)

| Disease or Impairment; Interval Between Illness and Application | Class of Risk | Exposed to Risk (Policies) | Actual Deaths: Policies | Actual Deaths: Lives [c] | Expected Deaths (Policies) | Mortality Ratio * (Policies) |
|---|---|---|---|---|---|---|
| Caesarean section [1] | | | | | | |
| Within 2 years | Substandard | 17,185 | 24 | 24 | 26.49 | 91 +16 −13 |
| 3–10 years | Standard | 11,456 | 20 | 20 | 33.65 | 59 +11 −9 |
| | Substandard | 19,846 | 35 | 32 | 43.06 | 81 +11 −10 |
| Apical systolic murmur | | | | | | |
| At examination | Standard | 35,824 | 102 | 85 | 95.33 | 107 ± 7 |
| Inconstant, without hypertrophy | Substandard | 17,292 | 74 | 70 | 62.83 | 118 ± 9 |
| Constant, transmitted [2a] | | | | | | |
| Without hypertrophy | Substandard | 118,716 | 734 | 699 | 333.47 | 220 ± 5 |
| Slight hypertrophy | Substandard | 9,315 | 79 | 70 | 26.67 | 296 ± 22 |
| Moderate hypertrophy | Substandard | 1,306 | 23 | 21 | 3.83 | 601 +107 −88 |
| Systolic murmur over pulmonic area not transmitted, without hypertrophy | Standard and Substandard | 58,967 | 141 | 115 | 143.07 | 99 ± 5 |
| At examination | | | | | | |
| Rapid pulse | | | | | | |
| At examination | | | | | | |
| 90–100 per minute | Standard | 29,329 | 101 | 88 | 85.62 | 118 ± 9 |
| | Substandard | 34,939 | 156 | 140 | 105.36 | 148 ± 8 |
| Over 100 per minute | Standard and Substandard | 6,957 | 28 | 24 | 17.37 | 159 +25 −21 |
| Intermittent or irregular pulse [4] | | | | | | |
| At examination | | | | | | |
| Under 5 per minute | Standard | 13,093 | 44 | 35 | 43.54 | 101 ± 10 |
| | Substandard | 12,298 | 85 | 80 | 56.06 | 153 ± 11 |
| 5–10 per minute | Substandard | 13,562 | 51 | 49 | 50.32 | 101 ± 9 |
| Over 10 per minute | Substandard | 6,985 | 18 | 18 | 22.00 | 82 +17 −14 |
| Family history of cardiovascular-renal disease | | | | | | |
| (Two or more cases under age 60) | Standard | 122,159 | 731 | 609 | 518.05 | 141 ± 3 |
| | Substandard | 3,327 | 25 | 22 | 13.53 | 185 +31 −26 |
| Neurasthenia or nervous prostration [1] | | | | | | |
| Within 2 years | Standard | 26,956 | 100 | 86 | 91.35 | 109 ± 7 |
| | Substandard | 16,695 | 74 | 68 | 42.16 | 176 ± 14 |
| Over 2 years | Standard | 67,722 | 354 | 283 | 304.07 | 116 ± 4 |
| | Substandard | 12,504 | 45 | 40 | 41.17 | 109 ± 11 |
| Psychoneurosis [5] | | | | | | |
| Any time | Standard and Substandard | 24,206 | 52 | 48 | 47.14 | 110 ± 11 |
| Insanity | | | | | | |
| Any time | Standard and Substandard | 8,988 | 49 | 41 | 27.56 | 178 ± 17 |
| Family history of insanity | | | | | | |
| (Two or more cases under age 60) | Standard and Substandard | 7,883 | 32 | 25 | 28.45 | 112 +16 −14 |
| Glycosuria | | | | | | |
| At examination | Standard | 43,617 | 204 | 171 | 184.21 | 111 ± 5 |
| | Substandard | 33,511 | 214 | 187 | 137.66 | 155 ± 7 |
| Family history of diabetes | | | | | | |
| (One case or more at any age) | Standard | 387,480 | 2,095 | 1,761 | 2,087.54 | 100 ± 1 |
| Carcinoma or sarcoma, operated | | | | | | |
| Over 2 years | Standard and Substandard | 5,788 | 47 | 39 | 31.86 | 148 ± 14 |
| Family history of cancer | | | | | | |
| (Two or more cases under age 60) | Standard and Substandard | 18,939 | 93 | 81 | 87.50 | 106 ± 7 |

* The probable deviations of the mortality ratios have been given for all ratios based on 35 or more deaths. For mortality ratios based upon 5–35 deaths, the confidence limits at the 50 per cent level are shown.

1. Classification limited to females or containing high proportion of females.
2. Includes cases specified as mitral regurgitation; (a) heart size based on clinical estimate.
3. Includes cases specified as aortic obstruction.
4. Without electrocardiogram.
5. Issues of 1942–1949 accounted for 60 per cent of entrants.

pertinent figures, for the impairment classifications discussed in the paper.

Pulmonary Tuberculosis—The volume of data on persons with a history of tuberculosis was fairly extensive. This reflects partly the increasing frequency with which cases have been discovered as a result of the widening use of diagnostic x-ray procedures in public health, clinical, military, and insurance medicine. In part, too, it reflects growing liberality in insuring persons with a history of tuberculosis, because of the sharp decline in the mortality from this disease and greater optimism with regard to the outlook for ex-tuberculous patients. It should be emphasized, however, that the experience covered carefully selected cases only: namely, those who had no signs or symptoms of tuberculosis and were active and in good health at the time of application for insurance.

For persons with a history of tuberculosis in the present study, x-ray pictures were generally lacking for the period shortly before or during the examination for insurance. Based on supplementary information furnished by 12 of the larger contributing companies, it appears that a current or new x-ray was obtained in only about one-fifth of the cases. Analysis of these supplementary data indicated that most of the cases accepted had minimal tuberculosis; this proportion was especially high for persons granted standard insurance and in cases insured within three to five years of recovery. The experience on cases insured within three to five years of recovery was, nevertheless, relatively unfavorable, the mortality on such persons insured at substandard premium rates being approximately twice the expected for standard life insurance risks.* For those insured from six to 10 years after recovery the experience on the very carefully selected cases to whom standard insurance was issued was relatively good, the mortality ratio being only 112 per cent. However, on cases to whom substandard insurance was issued, the mortality was appreciably higher, being about one and a half times the expected. On the very carefully selected cases accepted for standard insurance more than 10 years after recovery, the experience was good, with a mortality ratio well within the expected for standard life insurance risks. In contrast, the mortality on corresponding substandard cases was nearly one and a half times the expected.

The experience on persons with a history of tuberculosis when analyzed by age and by duration of insurance showed no consistent patterns. The fact that the relative mortality among the older lives did not show up better than that among younger lives underscores the continuing risk of the disease in older men who previously had active tuberculosis.

Among the more notable findings on persons with a history of respiratory tuberculosis was that underweights experienced mortality no higher, and in some instances lower than persons of average or above average weight. To some extent this reflected a higher proportion of female lives in the underweight groups. More important, however, it would seem that even for persons with a history of tuberculosis, the extra risk of death from the degenerative diseases of later life associated with even a slight degree of overweight currently overshadows the extra risk of death from tuberculosis and other respiratory diseases in the long-range picture. This is apparently why the long-range outlook for underweights with a history of tuberculosis may be so much better than for persons of heavier build with a history of tuberculosis.

The excess mortality among persons with a history of pulmonary tuberculosis was due primarily to recurrences and

* Here and elsewhere in this paper, the terms "expected for standard life insurance risks," "expected," and "normal" are used interchangeably to describe the mortality experienced by persons insured under standard Ordinary policies.

secondarily to other respiratory diseases. This confirms indications from clinical studies that pulmonary tuberculosis is by nature a chronic disease, and consequently, persons with a history of active disease need continuous medical supervision so that recurrences may be detected and treated promptly.

There has been marked improvement in mortality among persons with a history of tuberculosis. This is brought out by a comparison of the experience in the present study with that of the previous large intercompany investigation, the Medical Impairment Study of 1929 which covered the period 1909–1928. While the two investigations differed in a number of aspects, a fair indication of the trend in mortality is nevertheless provided by a comparison of the death rates in these two studies for underweight and average weight persons with a history of tuberculous infection more than two years prior to application for insurance. Among the underweights who were issued substandard policies, the death rates in the present study were markedly lower than those in the earlier study, particularly at ages under 30. In the average weight group who were issued substandard policies, the decrease in death rates was smaller, though still substantial, and was limited to ages under 40. In the earlier study the death rates among the underweights were higher than those among average weights up to age 50 at issue, whereas in the present study they were either lower or not significantly different from those among average weights in comparable age groups.

Co-residence with Tuberculosis—In the past when mortality from tuberculosis was high a great deal of interest centered on the influence of a family history of tuberculosis on longevity. More recently, attention has shifted to the influence of recent association with active tuberculosis, in recognition of the fact that even though there may be some inherited susceptibility to tuberculosis, this is less important than exposure to the disease. The experience on persons in close contact with one or more cases of active tuberculosis showed mortality above the expected when allowance was made for the high proportion of female lives in the group.

As in the case of personal history of tuberculosis, the mortality among the underweights who had recently been exposed to active tuberculosis was about as good or better than that of persons of heavier build. Tuberculosis was the major cause of excess mortality among persons coresident with cases of the disease, although it accounted for a relatively small proportion of the total deaths. Nevertheless, the results indicate that contacts are subject to an appreciable extra risk of acquiring the disease and might, therefore, benefit from periodic medical checkups.

Rheumatic Fever—Rheumatic fever is discussed next because streptococcal infection appears to play an important role in its etiology. Although occurring less frequently than in the past, rheumatic fever is still a serious public health problem from childhood until well into adult life. It is important not only because of its mortality in acute attacks, but also because of the permanent and serious heart damage often associated with the disease.

The experience in the study covered selected lives with a history of acute articular rheumatism. In so far as rheumatic fever is concerned, the most pertinent results are those for persons insured at ages 15–29 within five years of the illness, because the bulk of the cases in this class was probably due to rheumatic fever and not to other acute joint conditions. The mortality among all persons in this age range who reported a history of the condition within five years of application without any impairment of the heart was approximately one and three-quarters times the ex-

pected. In the entire experience in this age group the mortality from heart and circulatory diseases was more than three times the expected. This finding points up the sizable risk of recurrence of rheumatic fever, even though a considerable time may have elapsed since the last attack and no evidence of heart damage is found on examination.

Some indication of the mortality among persons with heart disease of rheumatic origin is provided by the experience on substandard risks with apical systolic heart murmurs found at examination who also reported a history of acute rheumatism or streptococcal infection. Among these individuals the mortality was approximately two and two-thirds times the expected where the heart was not enlarged, but about three and three-fourths times the expected where there was a small degree of heart enlargement, and nearly five and one-half times the expected in the small experience on cases with a moderate enlargement of the heart. The mortality rate among persons with mitral systolic murmurs, presumably of rheumatic origin was high in every age group, regardless of the length of time elapsed since the insurance was issued. The mortality ratio was particularly high among those who were in the age range from 15 to 29 when the insurance was issued. The excess mortality was primarily due to heart and circulatory diseases, the death rate from which was approximately five times the expected on cases with no reported enlargement of the heart and nearly 10 times the expected on cases with slight enlargement.

A small substandard experience on cases with aortic obstruction, which in most cases was probably also of rheumatic origin, yielded a mortality about five times the expected. The great majority of the deaths were due to heart disease and the death rate from this cause was more than 10 times normal.

Poliomyelitis — The experience on cases with a history of poliomyelitis relates only to those cases with severe deformity. It is reassuring to find that in the relatively large experience on those granted standard insurance, the mortality was about the same as for standard life insurance risks. Among those limited to substandard insurance, presumably because of more crippling deformities, the mortality was about one and a half times the expected. Among both standard and substandard cases the mortality tended to increase with advance in age at issue. The death rate from heart and circulatory diseases was appreciably above normal in both the standard and substandard sections of the experience.

Syphilis—Included in this study were only carefully selected risks with a history of syphilis who had reported a single infection for which they had received adequate treatment. The number of penicillin-treated cases was small. Consequently, the results reflect preponderantly the experience on cases treated with heavy metals. On the cases insured within five years after treatment, the mortality was approximately twice the expected, but those insured more than five years after treatment showed no excess mortality. The high mortality among cases insured within five years of treatment was largely due to accidents. While it is probable that the generally good experience represents very careful selection of risks with a history of syphilitic infection, the results are encouraging in showing that adequate treatment of syphilis by earlier methods had apparently been successful in many cases.

Caesarean Section—The experience in this classification is of interest in connection with maternal health and mortality. The women insured within two years of a Caesarean section, most of whom were limited to substandard insurance, had a mortality about one and a half times the average for female lives in-

sured at standard premium rates. The selected risks to whom standard insurance was issued from three to 10 years after the Caesarean had a mortality approximately equal to that expected for female lives insured at standard premium rates, but corresponding risks to whom substandard insurance was issued experienced death rates about a third above the expected.

The mortality rate was particularly high among the women to whom insurance was issued at ages under 30, but was also in excess of the expected for those insured at ages 30–39. In contrast, the experience on the women ages 40 and over when insured was quite favorable. It is significant that the major part of the excess mortality was accounted for by puerperal causes. It is evident that women who have had a child delivered by this method run an extra risk in subsequent pregnancies, but that of itself the operation has no adverse effects on the longevity of the mother.

Heart Impairments—The mortality experience on persons with apical systolic murmurs and on persons with abnormalities of the rate or the rhythm of the heart is of special interest from the public health standpoint, because these impairments are often found on medical examinations made in connection with public health surveys, as well as in clinical and industrial medical practice.

The extensive experience on persons with apical systolic murmurs showed that the mortality among those with inconstant or localized murmurs varied little from normal, but was materially higher than normal among persons with murmurs that were constant and transmitted, and among those with some cardiac enlargement. For instance, among persons with leakage of the mitral valve and moderate increase in heart size, the mortality was about six times the expected. The mortality ratios were generally highest among those insured at ages under 30.

In the largest single classification—that of persons with a constant murmur transmitted to the left but without increase in heart size—the mortality ratio at issue ages under 30 was 325 per cent, in contrast to less than 200 per cent at issue ages 30 and over. The major part of the excess mortality was accounted for by a high death rate from heart disease, which was three and a half times normal in this classification. In addition, mortality was generally higher than normal from other vascular and renal diseases, from pneumonia and influenza, and from malignant neoplasms. The mortality from the last mentioned cause was one and a half times the expected. The mortality among cases with mitral leakage has nevertheless shown substantial improvement in the past 25 years. This is brought out by comparing the experience in the present study with that in the Medical Impairment Study of 1929. In the recent study the death rate of such persons at ages under 40 was only about half that in the earlier study.

Another significant finding in the recent study was that systolic murmurs heard over the pulmonary valve have rarely any clinical significance, being largely in the nature of cardiorespiratory murmurs. The sizable experience in this classification produced mortality virtually the same as the expected for standard life insurance risks. Mortality from heart disease was only about three-quarters normal. The mortality from malignant neoplasms appeared, however, to be somewhat above normal.

The experience on persons with rapid pulse was limited to those with rates exceeding 90 per minute. Analysis was made separately for those with rates from 90 to 100 and those with rates over 100 per minute. Based on a large volume of data, the experience on risks with pulse rates of 90–100 accepted for stand-

ard insurance showed only slightly higher mortality than the expected for standard life insurance risks. In the corresponding experience on risks accepted at substandard premium rates the mortality was moderately higher, being about one and a half times the expected. Among the persons with rapid pulse of 90–100 accepted at substandard premium rates, there was a sizable proportion with minor associated impairments, and this may well have accounted for the higher mortality experienced. Malignant neoplasms accounted for a considerable part of the excess mortality among those with a rapid pulse accepted at standard premium rates; among those accepted at substandard premium rates, heart and circulatory diseases and tuberculosis, as well as malignant neoplasms, were responsible for the excess mortality. On the carefully selected cases with pulse rates exceeding 100 per minute, the volume of data on which was not very large, the mortality was about one and one-half times the expected.

The experience on carefully selected cases with intermittent or irregular pulses indicated that cases with such deviations from normal rhythm may have no cardiac impairment and that further investigation is frequently needed to screen out those with such impairments. The mortality on cases accepted at standard premium rates did not differ significantly from the expected, regardless of the frequency of the intermittent or irregular beats. On cases accepted at substandard premium rates, the mortality was significantly above the expected in only one subdivision of the experience.

The 1951 Impairment Study included the experience on more than 15,000 persons who in their applications for insurance had reported two or more cases of cardiovascular-renal diseases at ages under 60 among their close relatives. The mortality among persons reporting such histories was found to be significantly above the expected, indicating that the occurrence of cardiovascular-renal disease at a relatively early age in the family history may have a significant influence on longevity. For persons with such histories accepted for standard insurance the mortality ratio was 141 per cent, while the much smaller experience on those accepted at substandard premium rates produced a mortality ratio of 185 per cent. The excess mortality was due largely to high death rates from the cardiovascular-renal diseases.

A review of the experience of two large companies indicated that among those insured, who in addition to having a family history of cardiovascular-renal disease were either slightly overweight or had a slight elevation in blood pressure, the mortality was 70 per cent higher than expected; whereas among those with a similar family history of cardiovascular-renal disease but free of such impairments, the mortality was only 25 per cent above the average. Thus, it seems that the influence of family history becomes increasingly apparent among persons who show conditions associated with cardiovascular disease, such as overweight or hypertension.

Mental Disorders—On carefully selected risks with a history of neurasthenia or nervous prostration the mortality was only slightly above the expected, but on those accepted at substandard premium rates with a history of nervous illness within two years of application for insurance the mortality was moderately high, being approximately double the expected.

On cases with a history of psychoneurosis or psychasthenia—mostly males in whom the condition was detected on examinations in connection with entry into or during military service—the mortality was slightly higher than the expected. Suicide accounted for a major portion of the excess mortality, both among persons with a history of

neurasthenia and among those with a history of psychoneurosis.

Very carefully selected risks with a history of psychosis, most of them insured more than five years after recovery, showed a mortality nearly twice the expected in the aggregate. The mortality was particularly high at issue ages under 30. Again the excess mortality was largely accounted for by suicides.

Some light on the hereditary aspect of mental disease is afforded by the experience on insured persons who reported two or more cases of insanity occurring in members of the immediate family under age 60. This age limitation serves to eliminate cases of mental disease or degeneration due to cerebral arteriosclerosis. The mortality from all causes combined among these insured persons was somewhat above the expected. An earlier study had shown similar findings. Furthermore, in both studies the excess mortality among persons reporting a family history of mental disease was due to suicide.

Glycosuria—Early detection of diabetes is currently a major concern of public health officers and clinicians. Consequently, the mortality experience on persons found to have glycosuria upon examination for life insurance is of particular interest and value. In this experience on selected risks accepted for standard insurance, the mortality was only slightly higher than expected, but the mortality from diabetes was significantly above normal.

On risks with glycosuria accepted at substandard premium rates, among whom the proportion of cases with persistent or larger amounts of sugar in the urine was higher than among persons issued standard insurance, the mortality was about one and a half times the expected with deaths from diabetes markedly higher than normal. Deaths from diseases of the heart and circulatory system were also considerably above normal. In this connection it should be noted that diabetics are subject to higher mortality from the cardiovascular-renal diseases than nondiabetics.

The 1951 Impairment Study also included an experience on persons with a family history of one or more cases of diabetes. The mortality from all causes combined was normal, but the mortality from diabetes was nearly twice the expected. However, an earlier study of persons reporting two or more cases of diabetes in the immediate family produced a mortality ratio somewhat higher than normal.

Malignant Tumors—The data in the 1951 Impairment Study on persons who had had malignant tumors were relatively small and could not, therefore, be analyzed in detail by site. The over-all experience relates to surgical cases of carcinoma and sarcoma insured at least three years after operation; it is of special interest because it represents a follow-up of such cases extending in some instances for 15 years or even longer. Supplementary information furnished by four large companies regarding the site of malignancy showed that the breast was the most frequent site of carcinoma among these insured lives. The other sites most frequently reported were the genitourinary and digestive organs.

On cases accepted at substandard premium rates, most of them insured from six to 10 years after operation, the mortality from all causes was approximately twice the expected. In the entire experience on risks accepted at both standard and substandard premium rates deaths from recurrent neoplasms were nearly five times normal and accounted for more than half the deaths. On cases accepted for standard insurance, virtually all insured more than 10 years after operation, the mortality was within the range of the expected on standard life insurance risks.

Of interest also is the experience on persons with a family history of cancer

of two or more cases under age 60 among parents or siblings. The bulk of the experience was on persons granted standard insurance and the mortality among them from all causes was normal. However, the deaths from malignant neoplasms, which accounted for about a third of those from all causes, were more than twice the expected.

The study contains voluminous data that bear on the prognosis in various diseases. Much of this material cannot be summarized without omission of some relevant facts. This paper has attempted to present the more important facts and conclusions for a number of impairments that are of special interest to the public health profession. Its fundamental objective is to call attention to the 1951 Impairment Study as a unique source of new information on the long-term effects on persons with various medical and physical conditions and diseases.

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## Applying What We Know About Aging

"Aging—Applying Today's Knowledge Today," is the topic of the University of Michigan's Eighth Annual Conference on Aging to be held in Ann Arbor, June 27–30, 1955. The program will be focused on gaining greater skill in the use of principles, practices, methods, and technics needed for more effective service to older people. In addition to the general sessions, a series of 22 workshops will offer an opportunity to study the application of present-day knowledge to the solution of problems of older people in the fields of employment, housing, community organization, health, religion, education, use of leisure time, legislative action, and advanced planning.

Joint sponsors of the conference with the University are the U. S. Departments of Labor, and of Health, Education, and Welfare, the Civil Service Commission, Veterans Administration, Housing and Home Finance Agency, the Council of State Governments, Congress of Industrial Workers, Michigan Departments of Health, Welfare, Mental Health, and Employment Security, and the Michigan Medical Society.

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# Some Approaches to the Epidemiologic Study of Chronic Disease

PHILIP E. SARTWELL, M.D., M.P.H., F.A.P.H.A.

***Though only a small number of those in public health label themselves "Epidemiologist," there are few indeed among us who do not deal with matters to which epidemiology does contribute, closely or remotely. Two papers, which supplement and complement each other, make so clear the things that epidemiology can and cannot do that they are offered here in sequence.***

To begin with we may ask, what is the ultimate objective in studying the epidemiology of a chronic disease? Although methods may differ superficially, the objective is no different from that in acute communicable diseases, and the separation of acute from chronic, or infectious from noninfectious is arbitrary and justified only for purposes of discussion. In the broadest terms the answer to this question is the same as though we were asking the objective of studying the pathology or clinical behavior of the same disease, which is, of course, to increase our understanding of the disease to the end that it can be more effectively prevented or treated. Since effective prevention depends on knowledge of etiology, one of our principal goals is to identify and determine the relative importance of all etiologic factors involved in the production of the disease. This is an ambitious goal which can be reached only rarely through work in a single discipline, but requires coordinated efforts in many branches of medical science, such as clinical medicine, biochemistry, microbiology and epidemiology.

Frequently, the epidemiologist's role in working toward this goal is to provide an initial clue, or even a well supported hypothesis, pointing toward a specific, hitherto unrecognized etiologic factor. It is left to other investigators, working in other disciplines, to follow up these clues and further test their validity. An example may make this a little clearer. Through a long series of epidemiologic studies it was shown that there was an inverse relationship between the amount of fluoride in a community's water supply and the prevalence of dental caries. The hypothesis that fluoride ingestion in appropriate amounts provided protection against caries was then tested in the laboratory by means of animal experiments which provided considerable support for it. It was finally tested through controlled observations on populations deliberately exposed to the effects of the agent. On the other hand, laboratory or clinical studies may provide the initial hypothesis which is then tested through epidemiologic observations on groups of persons classified according to the presence or absence of the variable in question.

The epidemiologic method consists largely in relating the occurrence of disease to some characteristic of people, their environment, or their heredity. We

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This paper was presented before a Joint Session of the Epidemiology and Statistics Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 14, 1954.

seek to determine the distribution of the disease in terms of persons selected for attack, usually by means of comparative attack rates. Differences in the rate of progress of disease in different situations also may give useful information. Temporal relationships are also suggestive; thus, parallelism between the time trend of a disease and the prevalence of some environmental factor may suggest an association, or the tendency of a disease to develop at a certain age may suggest a relationship to some physiologic process. This last type of evidence, however, is comparatively unreliable.

The obvious first step in studying the epidemiology of a disease is to determine the characteristics of persons attacked. Much of what is presented in textbooks of medicine under the heading of epidemiology is learned through this elementary approach. The age of onset, sex, and racial distribution, and frequency of various circumstances in the patient's history, such as particular occupations, for example, can readily be determined for any series of cases. It immediately becomes apparent, however, that for such observations to have much meaning they must be related to the population. Moore [1] has referred to an approach to medical research which he terms "A Universe in Search of a Problem." I should like to paraphrase this to read "A Case Series in Search of a Universe." Well studied series of clinical cases can be readily found, but not the complementary information on the population needed for epidemiologic studies.

There are two elements in the rates employed in an attempt to discover the characteristics of people and their environment with which a disease is related. These are, of course, the numerator, or cases of the disease, and the denominator, or population out of which the cases arise. A classification of methods can be made on the basis of the way in which either the numerator or denominator is secured. The most familiar classification of chronic disease studies is a dynamic one, based principally on the way in which we arrive at the numerator. Studies are termed retrospective, if already existing and known cases of the disease constitute the numerator and are to be related to a population existing at the time the cases had their onsets. Other studies are termed prospective in which the cases are identified and counted as they arise in a population under continued observation. Much has been said about the relative virtues of these methods, the prospective method being generally regarded as more reliable and this classification will not be further considered here. In this discussion I shall attempt to sketch another possible classification related to this one, but based upon the denominator of the rates we wish to develop in the hope that this will help to clarify the problem.

SOURCES OF "DENOMINATOR DATA" FOR EPIDEMIOLOGIC STUDIES

1. Official census data.
2. Available information on special groups (e.g., industrial, insured, military, school).
3. Planned survey, done as a part of epidemiologic investigation by which cases are identified.
3a. Mass screening surveys.
4. Population sample, drawn to estimate the frequency of attributes for contrast with the cases.
4a. Cases of other conditions, in the same hospital, as "controls."

The classification depends upon the kind of denominator data chosen and their sources. The first and simplest source of a denominator is to utilize the information provided by registration of the population in some countries and in the United States by the decennial federal censuses. In order to relate the cases of a disease to the census population, it is necessary to have identified and enumerated in some way all of the cases in some political subdivision for which the census provides information.

Census information is generally quite reliable, so far as it goes, and definitive in that it pertains to precisely defined population aggregates. Its chief defect is that it is limited to age, sex, race, geographic, and population-density data.

In certain cities, it is true, the division into census tracts can also be made to provide information about quality of housing, income level, and socioeconomic status through the available figures for median monthly rental and average number of occupants per room in families living in each census tract. Such information was utilized by Terris [2] in a study of tuberculosis mortality in relation to age, sex, and economic status here in Buffalo. However, our knowledge of many chronic diseases is already sufficient to furnish at least a rough idea of their distribution according to the population characteristics given by the federal census. What we need is an enumeration of other factors not so readily known. The census as a denominator has already been exploited to a considerable degree and it is only capable of providing broad general information in any case.

The second type of denominator is an extension of that provided by the census. Useful denominator information is often found ready at hand when the population under study is a special group from whom specific items of information are routinely elicited. The members of the Armed Forces, the employees of an industry, the holders of life insurance, and the participants of group hospitalization insurance plans are examples, and many others could be cited. The portion of the studies of coronary disease by Morris,[3] which dealt with morbidity and mortality in the London Transport according to occupational factors, obtained its denominator data from this type of source. The enumeration of employees according to physical activity thus became possible. Two chief limitations of such studies may be recognized: first, they give information on special groups and some risk is involved in attempting to generalize from the findings; and second, the denominator information available, while often more detailed than that provided in the census, is still likely to be inadequate for exploring specific hypotheses.

We come to a third kind of denominator which is secured through a survey or census of a community or population group carried out as an integral part of the epidemiologic study and embodying the specific questions which are under investigation. One of the classic examples of this approach is found in the pellagra studies of Goldberger, Sydenstricker, et al.,[4] from 1916 to 1921. They made a series of house-to-house canvasses of all the families in 24 villages at fortnightly intervals for periods of from one year upward. These visits served two purposes: to identify the cases of pellagra, or numerator, and to obtain denominator data. In addition to the usual demographic status items, questions were asked concerning family income, economic needs, and dietary patterns. In addition, the sanitary rating of each community was determined with the aid of a number of indexes and seasonal fluctuations in the supply of different foods were measured. This study clearly showed the association of pellagra with poverty, its independence of the level of sanitation in the community, its remarkable seasonal distribution, and its bizarre selection according to age and sex. These epidemiologic characteristics were shown to be consistent for the most part with the hypothesis that a dietary deficiency was responsible and inconsistent with other hypotheses that were entertained at the time.

A great many other effective investigations by this method could be cited. Two recent examples are the studies of mortality in relation to smoking, one by Doll and Hill,[5] with British physicians as the subjects, and the other by Hammond and

Horn [6] in this country. The strength of the method lies in the confidence one may have that numerator and denominator data are properly matched and that both are classified in the same way with respect to specific variables. Its chief limitation is the fact that it is relatively expensive and difficult. This is particularly true if the disease is a rare one, in which case the population surveyed in order to secure stable rates of prevalence or incidence must number hundreds of thousands.

The number of variables concerning which information can be secured is also limited by the great number of persons who must be queried. For these reasons, the method in the past has been prohibitively expensive under such circumstances. However, the growing practice of collaboration between official and voluntary agencies operating over a wide area, as in the current study of poliomyelitis vaccine, makes this approach more feasible than formerly when there was less organization of health workers. Success with this method depends on asking the right questions, that is, the method is unlikely to provide the initial clues and the specific hypothesis to be tested must be determined in advance. Without fairly substantial scientific support for an idea, it is not likely that funds and manpower can or should be mobilized for this approach.

Opportunity to employ a variant of this third method arises in the conduct of mass surveys to detect chronic illness. The screening survey for diabetes in Oxford, Mass.,[7] by the Public Health Service permitted the establishment of rates of prevalence by age and sex, as well as some evidence regarding the genetic aspects of diabetes. If all of those tested had been questioned or examined regarding some other postulated factor as, for example, excessive past consumption of carbohydrate foods or deviation from normal weight, further information might have been secured. In addition, through the follow-up for several years of persons showing deviations in blood glucose or sugar tolerance insufficient for a diagnosis of diabetes and of suitable controls, some idea was gained as to the significance of these deviations.

A fourth approach may be taken in situations where we start with a sample of cases of the disease, but it is not feasible to secure denominator information on the entire population out of which they have arisen. It is possible to draw a probability sample of that population and to study it in the same way the cases have been studied.

With this method a comparison of rates of incidence or prevalence of the disease in two subgroups of the population selected for the presence or absence of the characteristics under investigation as possibly related to the disease (the independent variables) is not possible. Instead, the prevalence of these characteristics in the sample of persons having the disease has to be contrasted with that in the controls.

An example of this method is found in Westlund and Kurland's study of multiple sclerosis in Winnipeg.[8] For comparison with his series of cases, which included the known cases in the metropolitan area of Winnipeg, Westlund was fortunately able to draw a small sample of persons out of the larger number from that city who had been included in the Canadian Sickness Survey, matched for age and sex. An assumed date of onset identical with that of the matched case was assigned to each control, and the same lengthy history was obtained from these persons as from the patients in an effort to discover whether any factor in the past history showed a significant association with the disease. This method finds its chief usefulness in the study of relatively rare diseases and where comparatively elaborate information must be secured, so that large samples are impractical. The validity of results depends

on the degree to which the control sample is actually representative of the population from which the case series is drawn and, of course, upon the size of the two groups.

The final method to be discussed is a variant of the last mentioned one. Frequently, the sample of cases of a disease consists of all those cases seen in a particular hospital or group of hospitals. In such cases, instead of attempting to secure a sample of the normal population as a control group, a series of patients treated in the same hospital for some quite unrelated condition will be chosen. While this may seem a poor substitute for a true population sample, it has one possible advantage. There is always an element of selection in the admission of persons to a particular hospital, and properly matched controls taken from that same hospital may in some respects be more truly comparable with the cases than controls drawn from the general population. One never can be certain, however, that the disease or injury from which the hospital controls are suffering is not itself related in some way to the attribute under investigation. Collateral evidence from other directions is to be desired before broad generalizations are made from the results. The method is particularly attractive to clinical investigators because all of the material is available without going outside the hospital. This method, of course, is the one which in several independent studies provided the initial suggestion for an association between smoking and lung cancer.

The role of heredity in determining the occurrence of chronic disease is a subject of much importance. Relatively little is yet known about genetic influences on the development of the commoner chronic conditions. Presumably, one reason for this is that the environment as well as heredity must usually be taken into consideration. The methods of geneticists are quite different from those which have been discussed and the field of human genetics has grown up largely independent of epidemiology. This is demonstrated by the unfamiliarity to most epidemiologists of terms in the vocabularly of geneticists. For example, the term "propositus" is used for the first case of a disease coming to the attention of the investigator and thereby leading to a search for other cases among his blood relations. Epidemiologists will recognize that it has essentially the same meaning as the term "index case" which they have used, particularly in family studies, for some years. In bringing environment into the picture the geneticist cannot avoid an incursion into the epidemiologist's field; likewise, the epidemiologist cannot afford to be wholly unfamiliar with genetic principles and methods. In short, there is a need for more cross-fertilization between these two disciplines, leading to the development perhaps of hybrid investigators who will utilize the methods of both.

In this discussion nothing has yet been said about the interpretation of the association which may be found between a disease and some environmental feature. To make the issue concrete, we may suppose that it has first been noted from clinical studies that an apparently excessive number of cases of leukemia give a history of having engaged in industries where a certain chemical process is employed. Study by one of the methods outlined above has led to the development of a hypothesis that there is a direct association between exposure to a particular chemical and the occurrence of the disease. For this purpose, Method 2 would be the most practicable, utilizing mortality records of persons employed in different types of industrial plants or in different types of operations in such plants. Method 1 does not provide information on the specific attribute in which we are interested, but may be of some help in providing rates by age, sex, race, and urban-rural differentials, as well as time

trends which may furnish some support for the idea. Method 3 would be inappropriate because the disease is so uncommon and because it is not identifiable through routine morbidity surveys. Method 4 might well be employed at this point as an independent check on the association. If the rate of occurrence of leukemia seems to increase as duration of occupational exposure increases (having of course adjusted for age) this gives further support for the hypothesis.

Assuming that all findings from these approaches support the idea and that the relationship with occupation is big enough to be important, what is the next step? It is necessary to consider the probable significance of the findings. The possibility that the association is indirect must be looked into; association does not imply causation and hidden variables must be looked for. On the other hand, one should take care not to ignore an association simply because it seems bizarre and unreasonable. If reached by careful study by sound methods, it deserves a serious attempt at explanation and may give an important clue. The nature of the evidence to be considered before taking the long step from association to causation has been ably discussed by Dorn [9] in a paper entitled "Philosophy of Inferences from Retrospective Studies."

It is at this point that we may hope for aid from the experimental investigator. Obviously, this is a situation where controlled observation of human populations can be made, although controlled experiments in man cannot be resorted to. The laboratory worker may, however, be able to induce the disease or a related disease by subjecting suitable animals to the chemical agent. There are many cases where he cannot do so, either because of species differences or because the presumed carcinogen produces its effects only after a long period of exposure, longer than the life span of the experimental animal. In such cases, we must make our decision on the strength of the epidemiologic evidence alone. This requires repetition and amplification of the observations that have been made, using data from independent sources. This may lead to the development of a more specific and useful hypothesis by enabling us to identify more precisely the chemical structure of the agent, the necessary period of exposure, and the period of latency of the effect. Again, it may lead to the rejection of the hypothesis, but may raise new questions opening a new avenue of inquiry. In either case, if soundly planned and conducted, the studies are likely to further the broad purposes of epidemiology suggested earlier in this paper.

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# Cancer Morbidity Surveys: A Tool for Testing Theories of Cancer Etiology

HAROLD F. DORN, Ph.D., F.A.P.H.A.

Etiology—the branch of medical science that inquires into the causes of disease; so states the dictionary. This definition implies that there are recognized principles and methods for investigating the etiology of disease and that these must be known to and acknowledged by medical scientists. A hasty inspection of medical literature might confirm this impression.

The words, association, causation, and etiology, appear over and over again in discussions of a current topic in cancer, the use of tobacco and cancer of the lung. With finality and decisiveness one person will state that a given set of data reveals merely an association between the development of lung cancer and cigarette smoking. Another person, presumably with the same faculty of perception, unhesitatingly detects a causal relationship and points to the smoking of cigarettes as an etiologic agent of lung cancer. The facility with which association and causation are distinguished suggests that the distinction is as easy to perceive as that between a green and red traffic signal, provided, of course, one is not color blind.

I doubt that this is true. The qualities of association or causation are not inherent in a given set of observations, but are interpretations originating in the mind of the observer. Furthermore, the distinction between them is not so clear-cut as many discussions imply.

When we make a scientific generalization in biology or medicine we do not assert this generalization with certainty. We imply that, based on available knowledge, the generalization has a high probability of being correct, but also that this probability is subject to modification as new knowledge becomes available. We can never be certain that additional knowledge may not show that the generalization needs major modification even after it has been accepted as being true.

I know of no immutable criteria by which one can recognize an etiologic agent of a disease. Such agents usually bear no placard disclosing their identity. How then is etiology established in the study of human disease, in particular the etiology of a disease like cancer?

Since our customs and laws restrict deliberate experimentation on human beings, if this may conceivably be detrimental to their health or well-being, knowledge of the carcinogenic properties of a suspected agent ordinarily must rest upon indirect and circumstantial evidence. The principal methods which have been used to establish etiology of disease are:

Animal Experimentation—It sometimes is thought the results of animal experimentation will establish or disprove that a substance can cause cancer in man. This is untrue. The successful induction of tumors in an animal, such as the mouse, does not establish carcinogenicity for man. Similarly, the failure to induce tumors experimentally does not prove the agent employed will not cause

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This paper was presented before a Joint Session of the Epidemiology and Statistics Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 14, 1954.

cancer in man. Nevertheless, if an agent will cause cancer in an animal, this fact raises the suspicion that the agent also may be carcinogenic for human beings.

Removal or Counteraction of Suspected Agent—If the increased incidence of a disease disappears after the removal of the suspected agent or the counteraction of its effects, belief in the etiologic action of the agent is strengthened.

Clinical Study and Observation of Patients with Disease—This includes the study of the history and course of disease in individuals with different characteristics and living under varying environmental conditions.

Epidemiologic Studies—These include the study of the experience of persons exposed to supposed carcinogenic substances. The detection of any or all of the following furnishes evidence of the possible etiologic relationship between the development of cancer and a suspected agent; increased incidence of disease after exposure to the agent, localization of cancer in a specific site, shift toward a younger age at onset of disease, exposure to the same agent of all persons who develop a particular form of cancer, and observation of an unusual incidence of pathologic conditions, such as chronic dermatitis and papillomas which may precede the development of cancer.

Controlled or Partially Controlled Experiments on Human Beings — This rarely is possible if the disease is likely to impair permanently the health or well-being of the subjects. Such experiments usually are conducted with volunteers. A notable illustration was the investigation of the etiology of yellow fever by Walter Reed. Experiments with human beings are more common in therapeutic trials than in studies of etiology.

No one of these methods usually is sufficient to establish etiology with a probability sufficiently high to convince the majority of informed persons. More generally, belief in a causal relationship between an agent and a disease rests upon a synthesis of all known facts concerning the agent and the disease.

During the early stages of the collection and analysis of information the opinions of investigators concerning the interpretation of the available evidence are often conflicting. This critical examination and evaluation of observed data in turn stimulates the investigation of disputed points so that, little by little, evidence is accumulated until the majority of investigators agree that an etiologic connection between the agent and the disease either has been established or placed in doubt.

Investigations of etiology start with the tentative identification of a possible etiologic agent and an hypothesis concerning the manner in which it causes the disease in question. In the beginning, these may be only vaguely formulated. Indeed, the first ideas may be obtained from data collected for an entirely different purpose. However, eventually data directly bearing upon the hypothesis must be collected if much progress is to be made in correctly identifying etiologic agents.

There is every reason to believe that the principles and methods of epidemiologic investigation developed and tested in the study of infectious and communicable diseases can be equally effective in the investigation of the etiology of noncommunicable diseases such as cancer. The first step is the accurate description of the way in which the disease manifests itself in different population groups and in varying environmental situations. The principal objective is the collection of morbidity data that can be organized and synthesized so as to form the basis for the formulation of hypotheses concerning etiology.

There are many ways in which morbidity data may be used in the accumulation of evidence to establish the etiology of disease. I wish to illustrate two.

The first illustrates the focusing of general morbidity data upon a particular clinical impression concerning etiology. Although a broad knowledge of the way a disease manifests itself in different population groups in varying environments is an essential step in the epidemiologic study of disease, this knowledge remains unproductive unless it can be interpreted in terms of the processes by which variations in incidence are brought about. The collection of morbidity data from which incidence rates by age, sex, race, geographic area, and other relevant characteristics can be computed results in mute facts. These facts take on meaning for the study of the etiology of disease only after they are organized and related to some hypothesis or theory concerning etiology.

The first example compares the incidence of cancer among males and females. The incidence rate for all forms of cancer is almost identical for each sex (Table 1). This average rate conceals a striking difference in susceptibility to cancer of various organs and tissues. Nearly half (45 per cent) of the new malignant growths among females originate in the breast or genital organs. In contrast, only one in eight, or 12 out of every 100 males who develop a malignant neoplasm, will have cancer of the genital organs or breast. Two rather rare forms, cancer of the thyroid and cancer of the biliary passages, also are more common among females.

**Table 1—Incidence Rates from Cancer of Selected Sites by Sex**

| Primary Site | Male | Female |
|---|---|---|
| Breast | 0.8 | 70.6 |
| Gonads | 2.2 | 14.2 |
| Genital organs, other | 37.8 | 64.1 |
| Respiratory system | 38.2 | 8.3 |
| Skin | 50.9 | 36.2 |
| All other | 200.7 | 136.9 |
| Total | 330.6 | 330.3 |

Data from morbidity surveys conducted by National Cancer Institute. Rates per 100,000 adjusted for age to the total population of the United States, April, 1950.

All the other common forms of cancer occur more frequently among males than among females. Excluding cancer of the breast and genital organs, the incidence rate per 100,000 becomes 290 for males and 181 for females, a relative difference in risk of 60 per cent. A difference of this magnitude suggests that males either are more susceptible to cancer or that, as a group, they are more exposed to environmental carcinogenic agents.

Although the incidence rate for cancer of the genital organs for all ages combined is twice as large for females as for males, this ratio varies widely throughout the life span, a fact that suggests the existence of different etiologic agents. The contrast between the two sexes becomes sharper when the entire reproductive system—breast and genital organs combined—is considered as a unit. Figure 1 presents incidence rates by age and sex for cancer of the reproductive and nonreproductive organs.

Prior to puberty when many malignant tumors appear to be congenital or due to developmental defects, the incidence of cancer of the reproductive system is about equal for the two sexes. After puberty the picture changes rapidly.

By 30 years of age the annual number of new cases of cancer of the reproductive system per 100,000 females is greater than the corresponding proportion of males who develop cancer of any form. Not until age 50 is reached does the incidence of all forms of cancer among males exceed the incidence of cancer of the reproductive system among females. After menopause the rate of increase in the incidence of cancer of the reproductive system becomes less, while the corresponding rate for males increases sharply after age 50. As a consequence, the difference in rates steadily decreases and disappears around

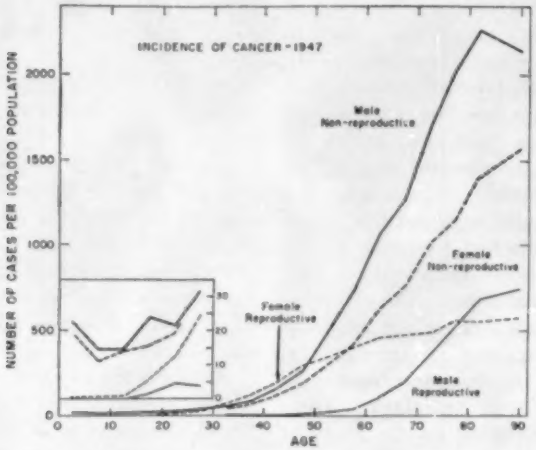


**Figure 1—Incidence Rates per 100,000 Population, Cancer of the Reproductive and Nonreproductive Systems, by Sex and Age, Selected Urban Areas of the United States, 1947–1948**

75–80 years of age. During the last few years of life the rate for males exceeds that for females.

The picture for cancer of the nonreproductive organs and tissues stands in sharp contrast to that for cancer of the reproductive system. Although the neoplasms of the nonreproductive system include a diversity of tumors, probably of separate etiology, the majority have a common characteristic—they are more common among males than among females. The excess for males is not great during the first three decades of life, but after age 30 it rapidly becomes larger. By age 40 the incidence rate for males is about 30 per cent greater than that for females; after another 15 years—at age 55—the differential has reached 75 per cent and continues at that level throughout the remainder of the life span.

Clinicians have long believed that the onset and prognosis of breast cancer is dependent upon the functioning of the endocrine system. In 1896 Beatson showed that mammery cancer, in some instances, could be caused to regress by oophorectomy. Since that time, irradiation of the ovaries and the administration of testosterone and estrogen have been tried as therapeutic agents.

Morbidity data support the supposition that the development of breast cancer is associated with endocrine disorders. In 1948 Clemmesen pointed out a temporary break in the rise in the incidence of breast cancer at the usual age period of menopause. Incidence rates for cancer of the breast from six separate morbidity studies are shown in Figure 2. The rates for Connecticut and for New York State, exclusive of New York City, are from unpublished data and are presented here by the courtesy of Drs. Griswold and Gerhardt.

The incidence rates from four of these studies—Denmark, New York State, Connecticut, and selected urban areas of the United States, 1937–1939—increase less rapidly between 45 and 54 years of age than during the ages immediately prior to and subsequent to these ages. The most marked change appears in the

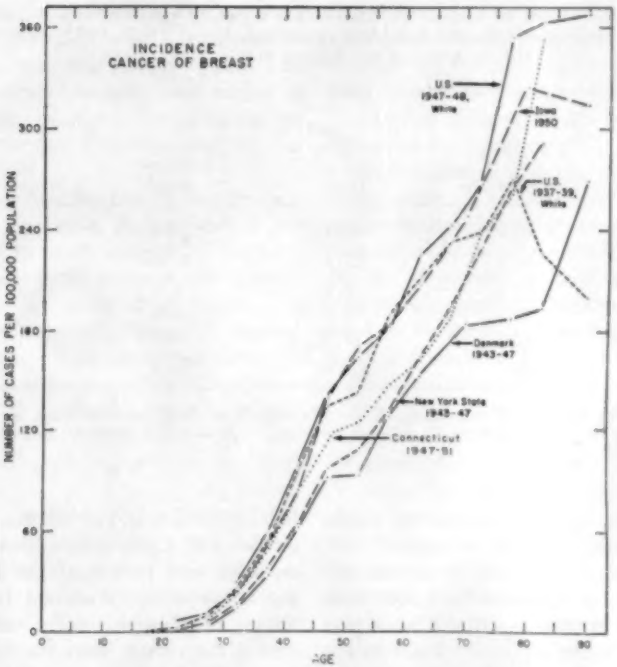


**Figure 2—Incidence Rates per 100,000 Female Population, Cancer of the Breast, by Age Selected Urban Areas of the United States, 1937–1939, and 1947–1948; Iowa 1950; Denmark, 1943–1947; New York State Exclusive of New York City, 1945–1947; Connecticut, 1947–1951**

data for Denmark, but the break is clearly evident in the data for the other three areas as well. Although the rate of increase in the incidence rate becomes less after age 45 in the data for Iowa and for the selected urban areas of the United States, 1947–1948, this decrease is not great enough to produce a noticeable break in the incidence curve.

Figure 3 shows incidence rates by age for breast cancer for single and married women in the selected urban areas of the United States, 1947–1948. The break in the incidence curve between 45 and 54 years of age can be clearly seen in the curve for single women, but is not apparent in that for married women. Clemmesen also found a much sharper

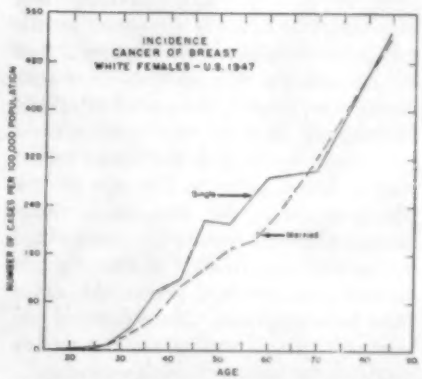


**Figure 3—Incidence Rates per 100,000 Female Population, Cancer of Breast, by Marital Status and Age, Selected Urban Areas of the United States, 1947–1948**

**Table 2—Incidence of Cancer of the Female Genital Organs: Annual Number of New Cases per 100,000 Female Population, Israel 1952–1953, Selected Urban Areas of the United States, 1947–1948**

| | United States | | Israel | |
|---|---|---|---|---|
| Primary Site | White Females | Total | European Jews | Oriental and Mediterranean Jews |
| Breast | 72.6 | 40.9 | 56.3 | 17.6 |
| Uterus | 56.3 | 25.9 | 31.0 | 18.7 |
| Cervix | 32.8 | 4.9 | 5.7 | 4.0 |
| Corpus | 10.3 | 8.1 | 11.8 | 2.5 |
| Unspecified | 13.2 | 12.9 | 13.5 | 12.2 |
| Ovary | 14.7 | 7.9 | 11.5 | 2.3 |

Rates adjusted for age using total population of United States April, 1950. Rates for Israel are based on data presented by Dr. J. Casper before the International Conference on Geographical Pathology in Washington, D. C., September 9, 1954.

break in the incidence curve for single than for "ever-married" women.

The greater susceptibility of unmarried females to cancer of the breast does not become apparent until the latter part of the childbearing period. Prior to age 30 the incidence of breast cancer is about the same for married and unmarried women, but after that age the risk of developing cancer of the breast increases more rapidly for unmarried women.

The existence of a relationship between the incidence of breast cancer and menopause is strongly suggested by the morbidity data shown in Figures 2 and 3. Physiologic changes associated with menopause, possibly hormonal in origin, temporarily slow up the rapid rate of increase in the incidence of breast cancer that is found prior to this age period. The strength of the association varies among different population groups and appears to be more marked among single women, most of whom presumably never have been pregnant. More detailed and intensive clinical studies are required to establish the nature of this association.

As a second illustration of the use of morbidity studies to test the validity of theories based on clinical impressions, the incidence of cancer of the cervix uteri in Jewish and non-Jewish women is cited. For many years clinicians have reported that cancer of the uterus was much less common among Jewish than among non-Jewish women and that cancer of the cervix uteri was exceedingly rare. Indeed, some questioned whether carcinoma of the cervix ever developed in females of unmixed Jewish ancestry.

To test this belief the National Cancer Institute in cooperation with Kupat Holim and the Ministry of Health of Israel initiated a study of cancer of the female genital organs in Israel beginning in January, 1952. Preliminary results from the first two years of this study are shown in Table 2.

These data establish that the incidence of cancer of the uterus among Jewish women in Israel is less than half that among white women in the United States. While the incidence of corpus cancer is practically the same in both groups, cervical cancer is found about one-sixth as frequently among Jewish women as among white women of the general population of the United States. The population covered by the cancer morbidity surveys in the United States included some Jews, but the proportion almost certainly was too small to have an appreciable

effect on the incidence rates. Cancer of the cervix uteri, although infrequent, is far from rare among Jewish women. The incidence rate is roughly comparable to that for cancer of the buccal cavity or pancreas among white females in the United States.

An interesting feature of uterine cancer is the variation in localization between Jewish and non-Jewish women. For the former, the primary site is more likely to be the body of the uterus, for the latter, the cervix is the most common site of origin. Here are two groups, not only with a difference in total incidence of cancer of a specific organ, but also with a marked difference in the site of tumor development within that organ.

The data in Table 2 also indicate that caution should be exercised in speaking of the Jews as though they were a homogeneous group with respect to susceptibility to cancer. The incidence of cancer of the female genital organs among Jews of European origin exceeds that among Jews from the Orient and Mediterranean region. Part of this difference may arise from a difference in willingness to seek medical care, even though in Israel medical care can be readily obtained.

The ratio of cervical to corpus cancer is reversed in the two Jewish groups. It is interesting that this arises primarily from a difference in the incidence of corpus cancer. Available data from the United States suggest that variation in the incidence of cancer of the uterus is due principally to variation in the incidence of cervical cancer.

Thus we see that morbidity surveys have placed knowledge of Jewish and non-Jewish differences in incidence of cancer of the female genital organs upon a much firmer foundation. The differences, although real, are not as great as formerly thought. Moreover, important differences in incidence are found within the Jewish population itself, a fact which suggests that existing theories of etiology need to be examined and subjected to the test of careful clinical and epidemiologic investigation.

This brief presentation of these two examples illustrates, rather imperfectly, the possibility of increasing knowledge of cancer incidence by means of morbidity surveys. The first step in the investigation of the etiology of a disease like cancer in human populations is a thorough understanding of the way it manifests itself in subgroups of the population, particularly subgroups with different characteristics and living under varying environmental conditions. This knowledge, combined with that gained from clinical experience and animal experimentation, can provide the basis for the formulation of hypotheses to account for observed variations in incidence. These hypotheses must then be tested by new clinical and epidemiologic studies of human populations. It is only by these methods that we can expect to increase our knowledge of the etiology of human cancer.

# Remedial Measures in Air Pollution Which Have Been Taken by an Industry, Including a Discussion of Costs

VIRGIL E. GEX

*It is likely that many of us think of air pollution prevention and smoke abatement as synonymous. To the extent that this misconception may prevail, it will be quickly dispelled by this revealing picture of another and entirely different aspect of the problem.*

Our air pollution problems at Procter and Gamble do not, so far as we know, create any physical health problems, but they can, if not properly handled, create mental health problems in that they may annoy our neighbors. It is with the viewpoint that we want to remain in good standing in the communities in which we operate and not to annoy our neighbors that we approach the problem of air pollution control.

My remarks will cover three general areas: First, is our laboratory work and developments in the field of odor measurement and control; then some of the different methods of control exercised in the factories to illustrate how complex this problem is in a chemical industry, and how wide a variety of approaches must be considered; finally, some of the costs involved in capital investment and operating expense. These costs are important to a profit making enterprise, since few measures for air pollution control pay their own way. For this reason we want to be sure that benefits to our neighbors are real before spending large sums of money in this field.

Our air pollution problems can be divided into two broad categories—the discharge of dusts or particulate matter and the discharge of odorous vapors. Of these two, dust discharges to the atmosphere are primarily controlled as a matter of course in plant design, to recover useful products, and the magnitude of the remaining problem of dust discharge to atmosphere has been relatively small. Dust control within our own factory buildings has received considerable attention, but our dusts contribute little to general atmospheric problems.

## Concept of Odor Quantity

Our problems concerned with odorous discharges have been harder to cope with than our dusts. This has been true primarily, we believe, because of the general lack of knowledge in the field of odor control and measurement. To help fill this gap in technical knowledge we have had a section in our Engineering Division for the past nine years, employing on the average two to three men, whose primary assignment has been the development of methods of odor measurement and control in order to place them on a more rational basis.

One of the problems we encountered early in our odor control work was the lack of any quantitative concept of odor. The conventional approach had been to measure the concentration of odorous contaminants in a given discharge, but this procedure had several weaknesses. First, identification of the precise odor-producing material might be a lengthy project. Second, different materials have widely different odor threshold concentrations, and this value would have

to be determined for each substance under consideration before any weight discharge of the material could be translated into an odor parameter. To avoid these difficulties we have developed a quantitative concept of odor which measures odor directly without regard to the material that produces it.

Diluting odorous samples to the threshold point is the usual way in which odor strengths are measured, since odors can be detected only by the physiological sense of smell. It appeared logical to us, then, to relate odor quantity in some way to the sense of smell. We have done this by establishing an odor unit as the amount of odor, regardless of origin, necessary to contaminate one cubic foot of air to the odor threshold or the "barely detectable" level.

Using this definition of an odor unit, the odor concentration, in odor units per cubic foot, can be measured directly by conventional threshold dilution technics. To illustrate this, picture an odorous air sample which must be diluted to 10 times its original volume to reach the odor threshold. The odor in one cubic foot of the original sample would then be contaminating 10 cubic feet of air at the odor threshold. Since this quantity of odor would be, by definition, 10 odor units, the odor concentration in the original cubic foot of odorous sample must have been 10 odor units per cubic foot.

This concept of odor quantity has proved very useful to us and we believe it would be useful to any one else in trying to reduce odor problems to a rational basis. By measuring odor concentrations and cfm flow rates from various vents, we are able to calculate odor emission rates, in odor units per minute, for various discharges, and compare them on a common basis. This enables us more readily to concentrate odor reduction efforts on the big odor discharges first in any program of odor reduction. We can also employ odor emission rates directly in stack diffusion formulas and calculate for a given set of conditions how high a stack should be to keep the maximum ground concentration below one odor unit per cubic foot. Since concentrations below unity would be below the threshold and, hence, undetectable, this gives us an excellent basis of design for eliminating community nuisance from an odor.

## Odor Measurement

To make use of this quantitative concept has required a suitable threshold dilution technic for measuring odor concentrations. There are available a number of standard laboratory procedures for such measurements, but we found that these were ill-suited for measuring highly concentrated odors in process vents. One common method required taking a sample in bottles evacuated to various vacuums, and "sniffing" the bottles later in an odor-free room. To measure a single odor concentration by this method required about as many bottles as one man could carry; when replicate determinations were desired on several samples the glassware problem rapidly got out of hand. Other methods, requiring successive dilutions of the same sample until the odor disappeared, suffered from contamination of the sample container walls by the concentrated sample and a distortion of the threshold point. All these bottle methods suffered from an unknown dilution of the sample with outside air when a sniff was taken at the bottle mouth.

To overcome these difficulties, a special sampling system was devised, which

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This paper was presented before the Engineering Section of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 14, 1954.

we have nicknamed the Osmo. This device, described in detail elsewhere,[1] consists of a continuous flow of 10–20 cfm of odor-free reference air into which increasing amounts of odorous sample are introduced, until odor is detected in the exit mixture. The ratio of total diluted flow rate to sample flow rate at the threshold point is measured and is the odor concentration of the sample in odor units per cubic foot.

We have used the Osmo extensively for measurement of plant odor discharges, for measure of removal efficiency of odor removal equipment, and for laboratory and pilot plant studies of odor removal. It has helped us to determine the design basis for various odor scrubbers and furnaces and to determine the optimum operating conditions for such equipment. An example of the latter involves several odor furnaces operating on a certain process exhaust at our different factories. The furnaces were operating at a 1,000° F. exhaust temperature in the belief that this destroyed the odorous material by oxidation. Pilot plant tests, later confirmed in the factories, showed that a much higher percentage of the odor was removed in a fairly narrow temperature band between 400° F. and 450° F. Operating temperatures for these units were reduced to 425° F. with an annual fuel savings of about $50,000.

A note of caution should be added about this system of field odor measurement. It is not precise, being subject to variations as high as ± 25–50 per cent, for one observer. It is sometimes subject to errors due to condensation or contamination of the equipment. At the present stage, it must be used by a trained engineer who can use intelligent judgment in interpreting results.

## Plant Approaches to Odor Reduction

Now to move on to the various methods that we have employed to control air pollution. These can be divided into four broad categories with several specific methods employed in each category: (1) operating technics, (2) process change, (3) special control equipment, and (4) dispersion.

## Odor Reduction by Operating Technics

Reduction of pollution discharge by changed operating technic is always attractive because it involves little or no investment. It requires constant vigilance and determination on the part of supervision and plant management, but this attitude can probably do as much to control odors from a plant as all the odor control equipment that can be installed. An excellent example of this attitude and its effectiveness concerns the operation of cleaning tank cars at one of our factories. The conventional procedure involved steaming the car liberally during most of the cycle, with excess steam escaping from the tank car dome and carrying with it large quantities of odors. The foreman was directed to set up a procedure for steaming which would limit the steam supply and prevent escape of odor laden steam. After consultation with his operators, he reported that such a procedure was impossible. The plant superintendent forthwith directed him to cease steaming tank cars and to have the operators enter the cars and scrub them by hand, if necessary, to prevent odor discharge. Within two days the foreman and his operators worked out a satisfactory steaming procedure that eliminates odor discharge and which has operated for several years without creating an odor nuisance from what was once a very odorous operation.

Other operating technics include care in blowing lines, keeping tank lids closed, inventory control to process quickly those stocks which may degrade in odor, or cleaning of storage tanks only when winds are blowing away from adjacent residences. Another procedure estab-

lished at some of our plants is to carry out a routine odor patrol of nearby residential areas. When odors from our plant are noticed by the patrol, they are quickly traced to their source and eliminated. The odor patrol has the authority to shut a department down if they believe the situation warrants it.

## Odor Reduction by Process Change

Process changes to reduce odor discharge should always be considered in any odor control program. Where possible, they may present the most economical way to eliminate or reduce an odor discharge. Two examples of this type come to mind: One of our process operations carried out in batches discharged odors at a high rate during part of the batch cycle. Conversion to a continuous operation had certain advantages, processwise, but could not be justified economically. The continuous operation, however, reduced the total odor discharged and spread it out over a longer period of time, so the change was made because of its odor control benefits.

Acidulation of soap stocks has been carried out by boiling with live steam which strips large quantities of odors out of the stock. Tests show that if the process is carried out at lower temperatures, using a recirculation jet instead of live steam for agitation, the odor discharge is reduced to 1/500 of its former value. The new method is being recommended to the management as an effective odor control measure.

## Odor Reduction by Control Equipment

The next category of control methods is that of pollution control by special equipment. This is usually the expensive method and the one we employ if operating technics or process modification will not do the job. A good way to illustrate the complexity of the air pollution control problem will be to name and describe briefly eight different types of such equipment installations which Procter and Gamble have employed.

Spray Condensers—These are used to condense hot, odorous vapors usually accompanied by steam, or to condense solvent vapors carrying a high load of noncondensibles. We have a number of this type of installation.

Enclosed Vent Systems—Groups of storage and work tanks are tied into a common vent header. Most liquid transfers are from one tank to another in the same system so that displaced vapors flow back to the first tank through the vent system and discharges to atmosphere are kept to a minimum by a vent condenser and vent relief valve. We have four such installations.

Packed Scrubbers—These are water scrubbers filled with ceramic packing. We have two sizable scrubbers for absorbing Hcl, and three sizable ones for dust removal, plus several other minor ones.

Venturi Scrubbers—These are high-pressure drop scrubbers for removing submicron size odorous aerosols and dust from exhausts. We have nine such installations.

Odor Furnaces—These heat process exhausts to 400° F.–1,000° F., depending on the exhaust, to oxidize odors to an inocuous state. We have four of these.

Activated Carbon Filters—These are applicable to low-volume discharges to adsorb odor. We have one.

Centrifugal Separator — These are mostly centrifugal cyclone separators installed for the dual purpose of product recovery and air pollution control, or for the primary purpose of pollution control. We have well over a hundred installed.

Air Filters—These are installed primarily for pollution control and there are well over a hundred installations.

## Odor Dispersal by Stacks

The fourth general category of pollution control we employ is the use of stacks for odor dispersal. This has been a very successful and, we believe, quite a valid method of control where odors are concerned. It would, of course, not be applicable where the quantity or nature of the emission is toxic. We use the stack diffusion formula as developed by Bosanquet and Pearson [2] and modified as to range of values for diffusion coefficients by Gosline.[3] It is used to calculate, for (1) the quantity of odor being emitted, and (2) controlling conditions of wind velocity and diffusion coefficients, the height of stack required to reduce the maximum ground concentration to a value below one odor unit per cubic foot, or below the odor threshold. We have installed or are installing 13 stack dispersal systems.

## Air Pollution Control Costs

This completes a general description of some of the things our company has done for control of air pollution. Now we might turn to the next logical question—how much does it all cost? The costs are appreciable. They are broken down into installation costs and annual operating costs in three general classes: (1) cyclones and filters for process exhausts, (2) cyclones and filters for room dust control systems, and (3) odor control installations.

For cyclones and filters for process exhausts we have spent since 1945 a total of $1,400,000 in installation costs. Operating costs are $250,000 per year. These installations recover considerable product materials. The figures for the value of recovered materials are not available, but I believe it exceeds the operating costs considerably.

Our cyclones and filters on room dust control systems, installed since 1945, cost $400,000 to install and $80,000 per year to operate. Again, the figures on value of recovered product are not available. The quantity recovered is much less than that from process exhausts, however, and I do not believe it pays for the operating expenses.

For equipment to reduce, eliminate, or dispel odors, we have invested over $1,000,000 since 1945. The operating costs for this equipment run $400,000 per year or more. There is no product recovery from these installations.

## Summary

I have attempted to develop for you a general picture of what Procter and Gamble, as a company representative of the chemical industry, has done to control or abate air pollution. Our program has included much technical effort devoted to development of odor measurement and control systems, much operating attention devoted to reduction of polluting discharges, and the installation of over $2,800,000 worth of pollution control equipment since 1945 with an annual operating cost totalling over $700,000 per year.

Our program is not exceptional. Rather, it is a typical approach of industry today to the complex problems of air pollution control. Industry is devoting a great deal of thought and time to these problems and where a problem exists it is willing to spend substantial sums of money, if it is satisfied that real benefits to the community will ensue.

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# Attending the Nutritional Needs of Patients in Nursing Homes—Theory and Practice

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***There is little in the literature to suggest that much is being done—other than the periodic licensing and necessary inspection of nursing homes—to improve the services they render to the chronic sick and the aged. That upgrading can be accomplished within the framework of the well staffed community health unit is indicated here.***

Public health administrators and nutritionists having responsibilities for standards of care in nursing homes, as well as operators of these medical care facilities, can benefit by determining as objectively as possible which circumstances help to bring nutrition practices in these homes into conformity with theoretic standards. Governmental supervision and regulation of places providing medical and nursing services to a group of people outside a hospital setting is a relatively new undertaking in these United States. Nassau County, N. Y., through its Health Department, is one of a few local units of government to have required licensure of nursing homes since 1941. The fruitful outcomes of a generalized educative and consultative—rather than an enforcement—approach which characterizes the effort there are matters of record.[1-4]

A review of the cumulative records of nursing homes under license in Nassau County provides only a partial basis for testing the assumption that an over-all effort at standard-setting will yield striking results in upgrading both the quality of the dietary of patients and the satisfactions of recipients of the food services. The following actions describe the extent and nature of any possible emphasis put on food and nutrition by Nassau County authorities responsible for licensure of the homes. During World War II a one-day nutrition institute for operators was held, its primary purpose being to help them to use wisely available ration points. During a two-month period in 1951 a consultant in nutrition from the Bureau of Nutrition of the State Health Department visited every nursing home and evaluated the menus in use. Subsequently, the public health nurse consultant to institutions on the staff of the county health unit interpreted the results of the study of 1951 as a part of the effort to raise generally standards of care in these homes. From time to time, and upon request, public health engineers on the staff of the county health department have assisted operators with problems of sanitary food service. As the public health ordinance requires that menus be made up in advance for a period of at least one week and kept on file, certain medical or nurse members of the licensing team occasionally checked the servings against the menus for that day.

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This paper was presented before a Joint Session of the Food and Nutrition and Health Officers Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 15, 1954.

Two facts particularly support the viewpoint that such gains as might be demonstrable result from integration of nutrition teaching in the generalized program rather than from any independent direct attempt to improve food and nutrition practices. They are: First, the local health department does not now and has not had a nutritionist on its staff and, second, the provisions of the local public health ordinance pertaining to licensure of nursing homes have never called for employment by these homes of a qualified dietitian or other person with special training in nutrition.

One could not be sure from this background that nursing home operators who receive generalized consultative and educational services give adequate attention to food service and nutritional needs of patients. Hence, this became the basis for the decision by representatives of the Bureau of Nutrition, New York State Department of Health, and of the Nassau County Department of Health to undertake a cooperative, open-end study of food and nutrition practices in the licensed nursing homes in that county.

Space limitations permit only the barest outline of the methodology of the study. A team of five persons, including the authors and a public health intern, assigned to the local health unit by the Office of Professional Training of the state health agency, did the recording, analyzing, and interpreting of the data and information. Forms for use in recording information were developed.

Only the nutritionist and public health intern, two persons who had never been in any of the 20 licensed nursing homes, were responsible for personally visiting those facilities in order to observe food and nutrition practices and to check them against the theoretic standards that appear in the literature, and which cover menu planning, food purchase, storage, preparation, service, housekeeping, and food handling. Those team members also were to determine the extent to which the patients in the homes eat the food and use the available facilities for group eating. The public health nurse consultant for institutions on the local licensing agency staff arranged for the visits to each of the 20 homes. She introduced the nutritionist and intern and explained the purposes of the study to the operator and employees.

Each visit lasted from four to five hours. The nutritionist observed a meal service in each home. During meal times and usually unaccompanied she visited with as many patients as possible to inquire about their enjoyment of the meals and to observe the satisfaction and adequacy of the particular meal being served. She talked with the cook in most of the homes to find out if the cook and the operator had similar views about meal planning and food service. The cook was also asked about cooking procedures, and some checking of the cook's statements were made by actual observation of food preparation for one meal. The operator or manager of each home was interviewed concerning food purchasing, menu planning, food preparation, and food service. Menus for a recent two-week period (mid-July to August 31, 1954) were obtained. The information gathered was recorded individually for each home. The menus were evaluated later by the nutritionist. The intern's visit coincided with that of the nutritionist and was of the same length. A floor plan of the kitchen was drawn for every home. The equipment used in food preparation was examined. An inventory was made of canned and perishable foods, either alone or in cooperation with the operator. Dishwashing and cleaning procedures were recorded.

When the nutritionist and public health intern had completed their appraisals of the homes and had written their reports, supervising sanitarians from the health department staff "scored" sanitary food practices, using the inspection report form for commer-

cial eating and drinking places covering the requirements of the local public health ordinance. All comparison between nursing and commercial restaurants made in this paper are based on the findings of these sanitarians.

The significant findings of this study may be summarized as follows:

Food Purchase—Most of the homes buy food from wholesale sources. All use standard brands and only food in good condition. Inventories made by the public health intern of food supplies on hand show that 65 per cent of the homes have sufficient canned goods to last one month; none has less than a week's supply of canned foods. Less than a week's supply of perishable food is on hand in only three homes.

Food Storage—In most instances, food storage is better than in typical public eating and drinking places. Refrigeration units, including deep freezers and walk-ins, generally are the equal of those of public eating establishments. By check with a standardized thermometer the sanitarians report temperatures of refrigerators to be between 38–50° F. and of freezers to be between —5 and 0° F.

Menu Planning—No home employs, singly or in combination with others, a qualified dietitian or other person trained in nutrition. In 18 homes the operator claims primary responsibility for planning menus; in the remaining two the cook is solely responsible for this. Few operators either carefully supervise or direct the activities of the cook. Thirteen homes post menus in the kitchen. Only eight homes keep a recipe file: of these, four use standardized recipes. Operators commonly avoid monotony in menu by varying offerings on any given day of the week.

Food Preparation—The nutritionist states that, "Cooking was done generally according to best current recommendations." Only once did observation indicate that food was prepared too far in advance of serving time.

Guides for Adequacy of Diets Served—Half the operators depend upon pamphlets and the "Basic 7"; four upon training and experience in nursing; another four on their unsupported knowledge of "What is good for people"; and only two rely upon previous help and menu evaluation furnished by the Health Department.

Food Service—Meal offerings occur at normal times. Supper, however, frequently comes early. The median interval for all homes between breakfast and supper is nine and one-half hours. The noon meal is the heartiest in all homes. All serve each patient on a tray bearing the individual's name. The best tray service includes the use of attractive paper or plastic tray covers of proper size. Food service is neat and attractive. Colorfulness comes from variety in choice of vegetables and other foods rather than by garnishes. All homes cater to some extent to the likes and dislikes of patients. All homes cut up, chop, grind, or use baby foods for those individuals who need easily chewed food.

Helpings were adequate. The operator offers second portions, but patients seldom wish them. Food is not set on trays until personnel are ready to carry them. Setting up one tray at a time is the common practice. Many homes use hot-plate covers. Eighteen homes have a dining area for patients. However, patients use these facilities in only 11 of the 18. Use and enjoyment of these facilities by the majority of patients able to be up and about is the exception rather than the rule. Even in dining rooms, tray service prevails.

Food Consumption—Patients await the meals with enthusiasm. They eat the food with relish, except for occasional small amounts of potato or bread. The patients appear happy and content both with the food and the whole atmosphere.

Those needing help with eating routinely get it. However, the standard practice is to encourage self-help. In addition to the three regular meals daily, all homes offer snacks. If there is only a single snack, it comes at bedtime. Acceptance of such extra food offerings by patients varies from day to day. There is need to obtain more information regarding content of between meal nourishment and to determine its contribution toward the adequacy of the diet. Food gifts brought in from the outside are uncommon. Most operators discourage this practice, for such gifts neither materially contribute to the adequacy of diet or lessen its value.

Special Diets—All homes make provisions for them. Salting foods during its preparation is uncommon. The physician, without exception, orders special diets. Review of the patient's condition takes place monthly or more often, but modifications of dietary prescriptions from the original order seldom occur. Of the many special diets, only diabetic diets were looked into particularly. Three homes had no diabetic patients at time of study. In the 17 homes caring for diabetics the modifications in diet vary. In three homes, the physicians specify proportions of carbohydrate, protein, and fat. In three others, the physicians only limit total calories. The diabetic diet in still another six homes consists of a regular diet with reductions of sugar, starches, and desserts. In the remaining five a regular diet is the fare in three and, in two, due to marked illness of patients, they receive special diets as tolerated.

Menu Evaluations—The diets offered do not always conform to the crude standard chosen, that is, the "Basic 7" food groups. In general, direct observation during the study period shows the size of the servings to be ample. Enough milk and eggs were purchased to meet the standard for the patient census of each home. Sufficient amounts of meat, fish or poultry, potatoes, bread, flour and cereals, and butter and margarine appear on the study menus. There is not, however, in some homes, a daily offering of citrus fruits, green and yellow vegetables, and other vegetables and fruits.

Administration of a standard dose of vitamins or of vitamin and mineral supplements almost universally takes place. The study menus reflect the sufficiency of food groups other than milk and eggs. This study did not include any attempt either to determine the adequacy of the nutrients in the meals, or of the 24-hour intake of residents in these homes. Further, very little precise knowledge of the nutritional needs of the aged is available. Therefore, one can only speculate on the significance of these findings.

Sanitary Practices—All homes have approved public water supplies and sewage disposal facilities. Dishwashing practices are superior to those of commercial eating establishments in spite of the fact that the latter generally have better physical equipment available. Air drying of washed and rinsed utensils and dishes is the method of choice by operators. Food-handling technics, such as handling raw and cooked food with tongs, spatulas, etc., rather than fingers vary from "as good" to "much better" than commercial practices. Storage of garbage is not always satisfactory, but collection frequency is.

Administrative Problems and Attitudes of Operators—Kitchens are frequently too small. Kitchen space per patient bed varies considerably. Half the homes have less than 15 and only two have as much as 25–29 square feet per patient bed. The 20 homes employ a total of 51 full-time kitchen personnel. This gives a ratio of one such worker to 11 patients. The median for monthly wages (exclusive of maintenance which six homes also provide) falls between $300–$400. Half of the operators find recruiting and keeping efficient kitchen help to be problems. The length of em-

ployment of the cook—the key worker—ranges from under six months to eight years; however, the median falls between one and two years.

The operators commonly declare the essentials of good food service to be: Employment of an experienced cook; attention to the likes and dislikes of patients; provision for group eating by patients; maintenance of a recipe file; careful supervision of kitchen personnel; access to and application of current authentic information regarding food storage, preparation, and service; and improvement of kitchen setup with particular reference to size and ventilation. Thirty-five per cent of the operators plan to modernize or expand their kitchen facilities.

Recommendations and Conclusions—Although the findings of this study are based upon observations extending over a short time period, they are in complete agreement with those in the cumulative records which the local Health Department has maintained since 1941 and are, therefore, representative.

The favorable findings of this study indicate that an over-all, nonspecialized approach to the setting of standards, as made in this county of over one million population, is reflected in improved food practices as well as in safe environment and constructive nursing care.

The existing food and nutrition practices, good as they are, could be bettered significantly. Necessary additions to the dietary offering to bring it into conformity with the "Basic 7" include a complete protein food and a cooked or finely chopped raw vegetable at suppertime, both a citrus and noncitrus fruit routinely each day, and milk if a light supper is eaten or at bed-time if not drunk at other times. Some indicated improvements in food service include using garnishes, serving supper later, supervising the cook more closely, developing standardized recipes and filing them for future use, expanding and modernizing kitchens, replacing old and purchasing additional mechanical aids to food preparation and service and dish and utensil care, improving both physical setup and use of dining room facilities, and modifying special diets according to changes in clinical condition of patients. It seems desirable to encourage operators to utilize more fully all available authentic resources in the field of nutrition.

No direct effort was made to accomplish any nutrition teaching during the study; however, the findings will provide further underpinning for the continuing attempt by the local licensing agency to upgrade food and nutrition practices in individual homes as an integral part of its program to elevate generally standards of care in these homes.

Few communities can make as comprehensive and costly an open-end study as this. Obviously, such a study is possible only when excellent interpersonal relations exist between nursing home operators and personnel of the licensing agency. Certain communities, however, where a comparable group of nursing homes has been subject only to accreditation by a state agency, might conduct a similar study in order to furnish data and information for comparison with those reported in this paper.

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# Mental Retardation as a Public Health Problem

JOSEPH WORTIS, M.D.

*That the speaker was invited to present this subject—so far removed from the conventional health program of the recent past—is a measure of the broadening outlook of current public health planning. That so many Association Sections joined to sponsor a symposium on special problems of the handicapped is a further, and heartening, sign of these forward-looking times.*

Mental retardation is a public health problem because the defects and deficiencies leading to mental retardation are both medical and social, while the treatment or rehabilitation of the mentally retarded demand both medical and social measures. Severe mental retardation is almost always the result of serious organic defect of the brain, usually complicated or aggravated by lack of proper special training. The milder degrees of intellectual backwardness are due to minor brain defects or, much more frequently, to educational and social deprivation in potentially normal human beings. A distinction is sometimes made, especially by British authors, between "mental deficiency," involving biological defect, and "mental retardation," implying a developmental inhibition due to social causes, but we shall follow American usage in encompassing all actual mental backwardness, for whatever cause, under the interchangeable terms of "retardation" or "deficiency."

## Causes of Retardation

The medical causes of mental retardation are many and varied, though all ultimately effect the efficiency of brain function. Among these may be mentioned: prenatal developmental defects of the brain, or prenatal injury from infection or other noxious agents during gestation, birth injury due to brain trauma or asphyxia, congenital lues, erythroblastosis fetalis, hydrocephalus, early encephalitides, tuberosclerosis, toxic or metabolic encephalopathies, and a number of endocrine and metabolic anomalies, such as mongolism, phenylpyruvic oligophrenia, cretinism, and rarer entities such as gargoylism, Hurler's disease, Tay-Sachs disease, and Hand-Schüller-Christian's disease. It may be said at this point that the common assumption that mental deficiency is usually inherited is untrue, and even the milder degrees of deficiency so often encountered in the same family from generation to generation are more likely to be the result of poor health, nutrition, and social deprivation than to familial genetic taint.

## Misuse of Mental Tests

The uncritical use of mental tests has unfortunately served to perpetuate some of the worst misconceptions of the nature of mental retardation, particularly in the case of the milder retardates or borderline groups. If we keep in mind the fact that all mental tests are tests of performance, and that performance at any given age is the result of both innate capacity and of previous training opportunities, it is clear why certain socially deprived groups who tend to score low on the I.Q. tests have often been

falsely regarded as biologically defective. This is strikingly illustrated by the data accumulated during World War II when army rejections for so-called "mental deficiency" hit the Negro population out of all proportion to their numbers, with nearly half of all rejections involving Negroes, and with a rejection rate per 1,000 over six times as high among Negroes as among whites. At the same time this rejection rate, state by state, closely paralleled the per capita expenditure for education, so that northern Negroes in some areas had a lower incidence of mental deficiency rejection than the whites in some southern regions.

This situation can be duplicated in many other social groups, so that native Indian, Mexican-American, Negro, Puerto Rican, foreign-born, or simply poor sections of our population tend to do poorly with our I.Q. tests. They thus comprise a disproportionately large element in our institutions for mental defectives and in the special classes for the mentally retarded, and comprise a disproportionately small element in our special facilities for so-called intellectually gifted children or in our higher institutions of learning.

## Scope of the Problem

Obviously any statistical estimate of the scope of the problem of mental retardation will be hampered not only by the same lack of reliable public health data found in other areas, but also by the wide variations encountered in the definition of terms. A simple and uncritical adherence to some of the current standardized tests, such as the Stanford-Binet, would yield an appallingly high incidence of morons, imbeciles, and idiots, which are conventionally supposed to be suitable diagnoses for those with I.Q.'s below 70, 50, and 20, respectively. Sampling studies have indicated that 4 per cent of our children score 72 or less, and 5.9 per cent score 75 or less in these tests, so that the figure of 3 per cent is widely regarded as a conservative estimate of the proportion of children likely to require special educational help because of mental retardation. In the country as a whole, with 31 million children attending school, this 3 per cent figure could indicate that 700,000 children would be regarded as mentally retarded. At the present time, only about 115,000 of our children are attending special educational facilities for the retarded, so that the disproportion between community need and community facilities must certainly be great. In New York City, where the situation can be described as relatively good, only a few hundred older children with I.Q.'s below 50 have been allowed educational facilities in our public schools, while over 10,000 children with I.Q.'s between 50 and 70 are placed in special classes. Elsewhere in the country such special educational facilities are much sparser, or altogether lacking.

The 3 per cent figure for children may be compared with the 716,000 rejections by the Army during World War II of men between the ages of 18 and 37 for "mental deficiency," comprising about 4 per cent of the men examined. The palpable injustice of this latter figure however may be recognized, not only from the fact that half those rejected were Negroes, but also from the fact that the rejection rate ranged from ½ per cent in some states to nearly 14 per cent in others. These figures, together with the figures for children, deserve to be treated with critical scepticism, but they serve to show, at any rate, how

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This paper was presented before a Joint Session of the American School Health Association and the Maternal and Child Health, Public Health Nursing, and School Health Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 14, 1954.

large a proportion of our population may be implicated, justly or unjustly, in the problem.

If we shift our attention to institutionalized cases, there were, according to the 1950 census, 134,000 individuals in special institutions for defectives in this country, excluding an unknown number in mental hospitals. Of this number, 38,000 were children. It can be confidently said that a substantial number of these could get along in their communities if proper opportunities for training, vocational placement, and supervision were available to them.

Statistical estimates from other countries hover around the 2–5 per cent range, but despite the varying estimates everybody is agreed that the milder degrees of retardation are far more common than the severe types. Certain widely quoted British statistics indicate that among every 100 mentally deficient children one is likely to find 75 mild, 20 moderate, and only five severe cases. As a consequence their social potentialities must be rated as generally good.

## Mongoloids and Severely Retarded Children

But if there are many individuals who in one or another context are falsely regarded as biologically deficient, there are certainly very many whose biological deficiencies are not given the special consideration they demand. This can be conveniently illustrated by reference to one group where the diagnosis of retardation cannot be questioned, such as mongoloids. Mongolism occurs in this area in about one birth out of 300. In spite of the common designation of these children as mongolian idiots—presumably because the mental retardation is often severe—we have found a wide range of intellectual capacity in these children, varying from the lowest to the highest levels of retardation. In spite of this, family physicians too often regard the diagnosis as a seal of doom and early institutional placement is usually recommended. As a result, many of these children are denied the benefits of family life and of special training in their own communities. It is not surprising that in our own clinic setting, the intellectual capacities of our mongoloid children are generally superior to those of institutionalized cases, not only because the more severe cases are more likely to be sent away, but also because a friendly home environment helps to promote the child's highest capacities. If adequate educational facilities were provided for these children, their educational capabilities could be further developed. Yet in New York City mongoloid children with I.Q.'s under 40 are barred from public education, while those with I.Q.'s between 40 and 50 are admitted only when they attain a mental age of four years, which means not until they are eight years of age or older. (A single new experimental school will be established in New York City this year for the more severely retarded.) Most of these children thus languish at home with pathetically limited social and educational opportunities. It is significant that 21 per cent of all children seeking help in our Retardation Clinic are mongoloid, and of these half have I.Q.'s of under 50. It is not surprising that most of these low I.Q. mongoloids were not eligible to attend public school.

It is also significant that nearly half the retarded children of all types seeking help in our clinic have I.Q.'s below 50, precisely because their educational and social needs are being so inadequately met elsewhere. Many of these children, because of their marked retardation and sometimes unusual appearance, are denied the opportunity of ordinary group play experiences and their social and psychological development is thereby further constricted. The resulting stresses and dislocations of family life not only provoke nervous reactions

in their family members, but in turn tend to complicate the child's development with secondary neurotic and conduct disorders. There is, however, an unfortunately widespread tendency nowadays to exaggerate the basic importance of these neurotic factors and to impute the retardation itself to "emotional blocking" or some such psychodynamic mechanism. As the child grows into physical maturity, all these hampering factors combine to render the child ineligible for useful employment and the painfully long struggles too often culminate in commitment to an institution.

Early diagnostic analysis of the retardation is often extremely important, not only for an estimate of prognosis and the promulgation of rehabilitation plans, but for medical reasons, too, for the detection of sensory loss, for careful psychological analysis, for early speech training, parental guidance, etc. Diagnostic clinics can and should become research centers for accumulation of data and development of research. Such clinics provide useful opportunities for the instruction of medical students and the medical profession. Already it can be said with certainty that improvement in the health of pregnant mothers, avoidance of the hazards of prematurity and stringent obstetrical precautions, could all contribute to the prevention of mental retardation. Public health nurses can perform a useful function not only in case finding, but also in planning for the training and guidance of the child at home.

## Community Planning for the Retarded

Although it is difficult to provide convincing statistical proof, workers of long experience on our clinic staff estimate that 60 to 80 per cent of our cases could, under favorable circumstances, perform socially useful work in a supervised setting. It should be borne in mind that we tend to see relatively severe cases in our clinic setting. During recent years we have recommended institutionalization in only 24 per cent of the children seen in our clinic, and even this figure would have been much lower if suitable family or community arrangements were available. Institutions for the care of severely retarded individuals, or of mildly retarded children for whom no adequate family or community care can be found, will continue to be needed, but the future development of work in this area demands far more attention to the encouragement of local community facilities for the retarded. Residential institutions, moreover, need not become a dead end for so many children, but should aim to return to the community as many as possible and as soon as possible. This calls for community planning with a close integration of educational, recreational, medical, social work, vocational training and placement facilities.

A key question in the whole problem of education of the retarded is the size of classes. Many mildly retarded children, especially the very large number who could be described as educationally underprivileged, would do much better when kept in classes with normal children, if only the classes were small enough to allow teachers to give them the consideration they deserve. But classes for the more retarded should be even smaller and the teachers in these special classes should be specially well trained and particularly well paid. Appropriate schooling should be provided for all retarded children, except for the very few utterly incapable of learning. Such special schooling need not be limited to ordinary academic training and in some cases may even disregard such conventional educational goals in order to teach the child self-care, habit training, social functioning, and simple vocational skills. All-day schools of a new type should be made available to children needing the care and supervision their families cannot provide.

Diagnostic and rehabilitation clinics must be more widely established, preferably in hospital settings, where teams of workers involving several medical specialties, together with auxiliary personnel, may study these children and assist in the rehabilitation work. Distressed and overburdened families need the enlightened help of social agencies to cope with their problems. And finally, and perhaps most important of all, vocational training and vocational placement opportunities under suitable safeguards must be provided the older children and adolescents, so that they may occupy a dignified, happy, and useful place in the work of the world. I see no reason at all why our federal government should not subsidize such sheltered workshops or subsidize workshop cooperatives set up in local communities. The number of retarded children who could not benefit from such a program is fortunately very small indeed.

It is not appropriate at this time to spell out the details of legislative changes or local policy measures that must be pushed to relieve the plight of retarded children and adults. The important thing is to recognize the need for comprehensive planning and for public health people to provide leadership in this field. An indispensable source of support in this work is the parent groups themselves, who have at long last set up an impressive national organization to promote the interests of their children. These parent groups not infrequently work closely with other parent groups interested in the cerebral palsied, since the problem of retardation and motor handicap is common to both groups. On a local level, parent groups tend to become focal points of activity and reform. Public health people can perform a specially useful function in sharing with these parents some of the modern scientific knowledge needed to cope with the problem.

ACKNOWLEDGMENT—I am indebted to Dr. Salvatore G. DiMichael and Elizabeth Boggs of the National Association for Retarded Children for much valuable data.

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## The Pharmacists Cooperate to Prevent Aspirin Poisoning

The Pharmaceutical Council of Greater New York is distributing to pharmacists of New York City a warning about accidental aspirin poisoning of children. The warning is in the form of a printed card giving some facts about the extent of such accidental poisonings and a paragraph suggesting that pharmacists inform customers on preventive measures. The card is signed by Leona Baumgartner, M.D., commissioner, New York City Health Department, which prints the cards for distribution by the Pharmaceutical Council.

# Relationship Between Pregnancy Experience and the Development of Certain Neuropsychiatric Disorders in Childhood

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*A continuum of reproductive casualty is postulated, extending from fetal deaths—abortion, stillbirth, and neonatal—through a descending gradient of brain damage manifested in neuropsychiatric disorders. The research and administrative public health implications of these findings and the concept of the continuum are briefly but provocatively discussed.*

During the past few years we have been engaged in a series of studies concerning the association of maternal and fetal factors with the development of cerebral palsy, epilepsy, mental deficiency, behavior disorders in childhood, and speech defects. A detailed description of the methods and results with regard to specific disease entities either have been or will be reported elsewhere.[1-4] Here, we would like to discuss these studies in a general way with particular regard to the methods used and the implications of the results.

The method of study was generally the same with a slight variation for each condition. It consisted of first selecting a series of cases that had been born in a given period within a particular geographic area. A record of events that had occurred during the mother's pregnancy was then obtained. The frequencies of complications of pregnancy, prematurity, obstetric and neonatal difficulties were then compared with a suitable control group.

The first study concerning cerebral palsy was carried out in the New York State Department of Health. The Crippled Children's case register maintained for administering the department's crippled children's program was searched for those children who had been born between 1940 and 1947 and the birth register maintained by the Health Department's Office of Vital Statistics was searched for the birth certificates of these individuals. Since 1940 in Upstate New York, the complications of pregnancy and labor, operative procedures, and birth weight have been voluntarily reported by physicians on the birth certificate in addition to such routine data as age of mother and order of birth. Comparisons of the frequency of complications, prematurity, etc., were made with the total births of children who had survived the first month of life. It was thought that the surviving group was

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This paper was presented before a Joint Session of the Maternal and Child Health and Statistics Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 15, 1954.

This work was aided by grants from the Foundation for Mentally Retarded and Handicapped Children of Baltimore, Md.

**Table 1—Summary of Sources of Information for Each Type of Neuropsychiatric Disorder Studied**

| Type of Neuropsychiatric Disorder | No. of Cases Studied | Geographic Area of Study | Years of Birth of Cases | Source of Cases | Source of Control Group | Source of Record of Mother's Pregnancy Experience |
|---|---|---|---|---|---|---|
| Cerebral Palsy | 561 | Upstate New York | 1940–1947 | Crippled Children's Register, New York State Department of Health | Total population of births in same area over same period of time | Reporting on birth certificate |
| Epilepsy | 564 | | | | | |
| Mental Deficiency | 1,081 | Baltimore | 1935–1952 | Clinics, hospitals, institutions, schools | Next birth certificate in Birth Register matched by place of birth, maternal age, and race | Birth certificates and hospital obstetrical records |
| Speech Defects | 424 | | | | | |
| Behavior Problems in Children | 1,151 | Baltimore | 1940–1945 | Referral by public school teachers and principals to Division of Special Services, Baltimore City Department of Education | Child in same classroom not referred to Division of Special Services | Birth certificates and hospital obstetrical records |

more suitable for comparison than the total birth group, since an infant who had not survived the neonatal period had no chance of developing cerebral palsy.

The investigations of epilepsy, mental deficiency, and speech defects were carried out in Baltimore. The cases selected were those of children registered in various clinics, hospitals, schools, and institutions in the city who had been born between 1935 and 1952 and whose birth certificates were located in the files of the Baltimore City Health Department. Certain information, such as maternal age, birth order, place of birth, etc., was obtained from the birth certificate. As a control series, the next child in the birth register who had survived the neonatal period from the same place of birth matched by race and maternal age group was selected. In those instances where the case and the matched control were born in a hospital information concerning pregnancy and delivery was abstracted from the hospital record. This was necessary since the reporting of complications, etc., on birth certificates was not instituted in Baltimore until 1949. The person obtaining this information from the hospital record was not informed which birth was a case or a control.

The behavior problem children were those who had been referred by public school teachers or principals in Baltimore to the Division of Special Services of the Department of Education and who had been born during the period 1940–1945.[5] (The psychological consultation service is located in this division.) A child of the same sex in the same class as the child with the behavior problem and who had not been referred to the Division of Special Services was selected as a control. This selection of a control resulted in automatic matching by race, economic status, and age due to segregation and school districting. Controls were chosen in this manner in order to be certain that they were without be-

**Table 2—Summary of the Association of Maternal and Fetal Factors with Certain Neuropsychiatric Disorders of Childhood**

| Type of Neuropsychiatric Disorder | | Frequency of One or More Complications (Per cent) | Prematurity (Per cent) | Abnormal Neonatal Conditions (Per cent) | Total Abnormalities (Per cent) | Maternal Age and Birth Order | Maternal History of Previous Infant Loss | Operative Procedures |
|---|---|---|---|---|---|---|---|---|
| Cerebral Palsy | | | | | | | | |
| | Cases | 38 | 22 | Not studied | | +?* | +* | —* |
| | Controls | 21 | 5 | | | | | |
| Epilepsy | | | | | | | | |
| White | Cases | 27 | 13 | 17 | 34 | — | + | — |
| | Controls | 19 | 4 | 6 | 25 | | | |
| Nonwhite | Cases | 47 | 15 | 14 | 35 | — | + | — |
| | Controls | 43 | 12 | 3 | 50 | | | |
| Mental Deficiency | | | | | | | | |
| White | Cases | 35 | 12 | 16 | 46 | + | — | — |
| | Controls | 25 | 7 | 8 | 31 | | | |
| Nonwhite | Cases | 39 | 18 | 7 | 65 | + | — | — |
| | Controls | 55 | 12 | 6 | 60 | | | |
| Behavior Disorders | | | | | | | | |
| White | Cases | 33 | 6 | 10 | 39 | — | — | — |
| | Controls | 25 | 2 | 7 | 31 | | | |
| Nonwhite | Cases | 64 | 17 | 14 | 73 | — | — | — |
| | Controls | 51 | 5 | 15 | 54 | | | |
| Speech Defects | | | | | | | | |
| White only | Cases | 25 | 5 | 9 | 29 | — | — | — |
| | Controls | 19 | 0 | 11 | 26 | | | |

* + = Definite association
+? = Suggestive association
— = No association

havior problems as defined in the study. Birth certificates and hospital records were reviewed and the necessary information was obtained. The methods of selection of the groups in these studies are summarized in Table 1.

## Results

Space does not permit a detailed report of the findings in all of the studies. As a prototype of these findings, we would like to review the results with regard to cerebral palsy in slightly more detail and then review the other findings more generally. The results are briefly summarized in Table 2.

The mothers of about 38 per cent of the cerebral palsied group had had complicated pregnancies as compared with 21 per cent of mothers with children who had survived the first month of life. With regard to specific complications of pregnancy, the data suggested that those complications resulting in higher stillbirth and neonatal death rates had a greater degree of association with cerebral palsy. Those complications which are more prone to produce nonmechanical injury to the fetus, such as placenta praevia, were more highly associated with cerebral palsy than those complications such as dystocia which usually result in mechanical trauma.

It was found that 22 per cent of the cerebral palsied group had been prematurely born as compared with 5 per cent of the total births. This association existed both when prematurity did and did not result from complications of pregnancy. A possible influence of maternal age and birth order was suggested

in that there appeared to be an excess of older mothers with first births in the cerebral palsied group. Further investigation, with a larger series of cases, would be required to substantiate this observation. No association was found with operative obstetric procedures. An observation of considerable interest was that 35 per cent more of the mothers of the cerebral palsied children had a history of one or more previous stillbirths or infant deaths than the control group.

In the other neuropsychiatric disorders, the necessity of obtaining the required information from hospital records made it possible to collect data on the neonatal condition of the infant. In view of the associations between complications, prematurity, and abnormal neonatal conditions, it was considered necessary to summarize these factors by disregarding the overlapping that occurs between these conditions. Thus, we considered only those children who were exposed to one or more complications, prematurity without complications, and neonatal abnormalities without either complications or prematurity. This net result is expressed in Table 2 as total abnormalities. It was also necessary to take into consideration the fact that a given case might have one or more of the neuropsychiatric disorders. The data presented in Table 2 refer to cases with only one disorder.

The findings with regard to epilepsy and mental deficiency are in general similar to those observed in the case of cerebral palsy. There exists an association of these two conditions with complications of pregnancy and abnormal neonatal conditions and prematurity. In addition, those complications which were actually significant were those associated with nonmechanical fetal injury. In the case of mental deficiency, there was an association with maternal age and birth order which was not present in epilepsy. On the other hand, mothers of the epileptics had had more previous infant loss than the control group. This was not observed among mothers of the mental defectives.

The frequencies of the abnormalities that were studied were not significantly greater among the nonwhite cases as compared to their controls, although they were all in the same direction as was found among the white cases. It is not completely clear why the nonwhite differences were not significant. It is possible that the much smaller number of cases was not sufficient to demonstrate a difference. In addition, the nonwhites have a smaller percentage of hospitalized births leading to some selection for abnormal pregnancies and deliveries which would tend to diminish differences between the cases and controls. In neither of these disorders was an association with operative procedures found.

In the behavior disorder group, an increased frequency of complications of pregnancy and prematurity was observed. The specific complications that were excessive were those productive of nonmechanical fetal injury. No association was found with regard to operative procedures, maternal age, birth order, and mother's history of previous infant loss. Of considerable interest was the fact that when the various types of behavior disorders were studied individually only a specific type was found to be associated with maternal and fetal factors. The behavior disorders so incriminated were those classified as the "confused, disorganized and/or hyperactive" group.

In the case of speech defects where there exists an impression that there is a relationship with pregnancy experience, no associations with the factors studied were found. Frankly, we must admit that such a completely negative result was comforting since it eliminates the possible existence of a constant bias that may have been inadvertently introduced into the routine processing of the material.

Several considerations must be taken into account in interpreting these results. Of prime importance is the fact that in cerebral palsy, mental deficiency, and epilepsy the association is not with a single set of factors. There appears to exist a pattern of relationship which provides additional support to the findings. This is not true in the case of behavior disorders where the association would appear to be more limited in scope. However, in this instance, some weight must be given to the fact that the association appears to exist with a particular type of behavior disorder which has been suspected on clinical grounds as being the result of organic brain damage.

## Discussion

Prior to considering some of the implications of these results, it is important to keep in mind the limitations on interpretation imposed by the type of material utilized. The question of possible bias due to the selection of cases from case registers of a health department and from clinics must be borne in mind. This would be particularly true with regard to socioeconomic selection of the cases. In the studies carried out in Baltimore, a comparison of the cases and controls with regard to socioeconomic status, using census tract data, indicated that they were alike in this respect. Serious consideration must be given to underreporting of the maternal and fetal factors on both birth certificates and hospital records. However, it seems to us that this would tend to diminish the degree of association rather than strengthen it. An important limitation results from the fact that each of the neuropsychiatric conditions studied probably represents a heterogeneous group of conditions caused by multiple factors. Consequently, these results should not be interpreted as implying that maternal and fetal factors are the only etiologic ones. Nonetheless, they would appear to be rather influential and a quantitative estimate of their relative importance must await more refined methods of investigation.

In interpreting these results in terms of specific causal effects, a reasonable hypothesis would appear to be that the various maternal and fetal factors either produce, or influence the production of, injury to the brain of the fetus. The fact that those complications which are incriminated are those that result in anoxia or nonmechanical injury, rather than those that result in mechanical injury is in agreement with pathological observations reported by other investigators.[6, 7] Of course, any extrapolation from statistical associations to biological causes and effects must at this stage be considered speculative.

Of considerable interest is the fact that the pattern of factors, such as pregnancy complications and prematurity, which are associated with the neuropsychiatric disorders studied are those which influence infant loss. This has led us to postulate the existence of a "continuum of reproductive casualty" with a lethal component consisting of abortions, stillbirths, and neonatal deaths and a sublethal component consisting of cerebral palsy, epilepsy, mental deficiency, and certain behavior disorders of childhood. This implies that certain conditions occurring in utero may result in lethal damage to the infant. A certain proportion of the fetuses are able to withstand the lethal effect and survive with varying degrees of sublethal injury which would be manifested as organic damage to the brain. Indirect support for this hypothesis is obtained from the fact that the strength of association with the factors studied is greatest in the case of stillbirths and neonatal deaths, but is successively less in cerebral palsy, epilepsy, and mental deficiency and least in the case of behavior disorders. Thus, the gradient of the degree of association parallels what might be considered a

gradient of clinical severity of the disease entities studied which in turn reflects the amount of organic brain damage present.

These findings indicate that hope for the prevention of these disorders, at least in part, must be based on attaining knowledge sufficient to prevent the various complications of pregnancy and other abnormalities. This knowledge is not available at present. The hypothesis of the "continuum of reproductive casualty" provides a conceptual framework for further research. It emphasizes the need for a concurrent longitudinal study starting as soon after conception as possible and continuing through the prenatal and natal periods until the child is several years of age. Detailed information of events occurring during the prenatal, natal, and postnatal course could be obtained and related to fetal deaths, malformations, and congenital diseases and disabilities. Since the state of the mother prior to conception may also have an influence on the outcome of pregnancy, this also should be included in such a study. Thus, a fruitful area of research would be a study of the relationships of intrauterine and endocrine abnormalities to maternal complications and of these abnormalities to the fetal and postnatal development of the child.

In addition, these results have a bearing on the selection of indexes for the evaluation of programs or services. During a period of high mortality, the prime objective of medical care and public health programs is the reduction of mortality. In the case of maternal health programs, maternal and infant mortality have diminished to unexpected levels. It appears that maternal and fetal morbidity in addition to producing death are also related to certain neuropsychiatric disorders which are in themselves important public health problems. Therefore, in this period of low mortality, should not our emphasis be shifted to maternal and fetal morbidity and should not indexes of such morbidity be developed? Admittedly, this is a difficult problem, but it appears to be basic to the next phase in maternal health program planning. This would also prevent the development of an attitude of complacency which results from noting the marked mortality changes that have occurred during the past 20 years.

Before concluding, there are two points of a methodological nature that appear worthy of mention. In epidemiologic research we are accustomed to study the distribution of a disease by certain population parameters, such as age and sex. In the studies that we have discussed, the characteristics of the individuals studied relate to the time prior to their birth and to the period of their fetal existence. That such characteristics might have importance for other types of diseases is suggested by the recent work of Strong and other investigators.[8] In mice they have obtained evidence that suggested an influence of maternal age on the incidence of mouse leukemia and other types of malignancies. A second point of interest relates to the fact that these studies resulted from a collation of data routinely obtained by health departments and hospitals. We are certain that greater use can be made of such records in other areas of research, perhaps not for the investigation with conclusive results, but for one that provides hypotheses and serves as the necessary basis for further research.

In summary, significant relationships exist between certain abnormal experiences during pregnancy and parturition and such neuropsychiatric disorders of childhood, as cerebral palsy, epilepsy, mental deficiency, and behavior disorders. This relationship is not present in speech disorders when the other conditions are absent.

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Of all state health needs one of the most urgent is the strengthening of local health services, including program evaluation and staff training. Local health services, although they have grown almost unbelievably in the past 50 years, still fail to satisfy minimum standards of adequacy in many areas; today about 30 per cent of the nation's counties containing more than 10 per cent of the population have no full-time local health units. Evaluation of public health services remains a relatively undeveloped, imperfect procedure; yet without adequate measures of accomplishment the states lack a reasonable basis for improving their programs. Undergraduate, technical, and inservice training need emphasis at the state level if the nation is to obtain enough qualified local health personnel. The federal government could do more to encourage the states to use a greater part of federal health grants for all these purposes.

### The Task Force Recommends:

That the federal government strengthen state health programs by maintaining federal grants for health at least at the average level of the years 1948 to 1953, by emphasizing grants for general health purposes as distinguished from categorical purposes, and by allowing each state to transfer among categories a reasonable proportion of such grants; and

That the federal government authorize and encourage the states to use a larger share of the grants for the training of health workers, the evaluation of state and local health programs and the strengthening of local health services.

(From the Report on Federal Medical Services. Prepared for the Commission On Organization of the Executive Branch of the Government by the Task Force on Medical Services, February, 1955, pp. 74–75.)

# Medical Care and Rehabilitation Under Workmen's Compensation

## Present Status and Critique

JEROME POLLACK

*If the injured or ailing industrial employee remains a responsibility of public health administration in so far as he is inadequately cared for by other social agencies, then this picture of the current situation is of interest to a wider professional audience than that to which it was presented.*

The dominant theme in the development of workmen's compensation was to provide cash benefits to indemnify disabled workers for their income losses. Medical care and rehabilitation were conceived as peripheral benefits, inadequately provided for—sometimes omitted entirely—and often in conflict with the rest of the program. Time has brought recognition that full access to a high quality of medical care and to the means for modern rehabilitation are essential elements of compensation and that the further development of this now ailing system of social insurance depends on their complete integration in the compensation process. This article evaluates the present status of medical care and rehabilitation under workmen's compensation.

### Medical Care

Workmen's compensation is operating a medical care program on a scale never anticipated when the laws were written. Cash compensation is paid to over 1-1/3 million workers annually—to some 400,000 in an average week [1]—but medical care is provided for at least seven million disabilities a year.[2] As much as one-third the cost of all compensation benefits is spent for medical and hospital care. This year the cost of this medical care program will probably reach $300 million,[1, 2] some 3 per cent of all private expenditures for medical services and supplies, and about one-sixth the benefits of voluntary health insurance plans in the United States.[3]

Coverage—About 39 million workers—four out of five civilian wage and salary employees—are now covered under the nation's compensation laws.[1] In all states they are entitled to medical care for work-connected injuries. Medical care for occupational diseases, however, is markedly more limited. As many as 17 states limit coverage to diseases specified in their laws; four recognize silicosis or a handful of related diseases only, and two states do not cover occupational diseases at all. Where a disease is not recognized by the law, medical care does not have to be provided even if clinical findings show that it was in fact incurred as a result of the employment. In some states the allowance for medical care is especially limited for diseases, or is reduced if a disease is not totally disabling.[4]

Scope and Extent of Care—Services provided to injured workmen are usually defined to include such medical, surgical, hospital or other attendance, treatment, and services as may be required. Most states provide for medicines, surgical supplies and appliances, crutches, ap-

paratus, braces, supports, splints, artificial members, etc. There are, however, states in which some of these items, especially prosthetic devices, are still not provided.

The extent of care is usually limited. In only 12 states, the District of Columbia, Hawaii, Puerto Rico, and under the federal compensation acts, is complete care guaranteed by law regardless of its duration or cost. In another 19 jurisdictions, care beyond the specified limits may be extended by administrative action. The remaining 16 states—covering more than one-fourth of all workers under workmen's compensation—impose rigid limits. Entitlement to medical care in these states most commonly expires after six months, but the time limit may be as low as four weeks. Cash limits are typically $1,500, but may be as little as $300.

Such limits on the extent of care have tended to discourage the use of new drugs, new equipment, new appliances, new patterns of treatment, or the introduction of whole new fields like medical rehabilitation. In such long-term cases as paralysis, often requiring from one and one-half to two years' care, the amounts available or maximum time allotted are not enough to undertake rehabilitation. The limits become operative at a time when the individual has suffered a severe economic loss, only fractionally restored by the cash compensation, and when he is likely to be unable to bear its impact. Thus, they are likely to impose a great strain on family resources or a charge to the community.

Some employers ignore the limits. Insurance companies are offering to sell coverage "in addition to any medical benefits provided in the applicable workmen's compensation law." [5] But other employers require the limits to be enforced. Early this year the Indiana Appellate Court found that in the absence of agreement the Industrial Board had no authority to extend medical treatment beyond the 180-day maximum without sufficient competent evidence that additional treatment would limit or reduce the extent of disability or impairment.[6] Indiana is one of the states credited with providing full care by administrative authority.

Internationally, unlimited medical care has come to be regarded as a minimum standard of security against employment injuries. Reductions below this standard are regarded as justified only as "temporary exceptions" in countries "whose economy and medical facilities are insufficiently developed." [7]

Choice of Physician—Three-fourths of all covered workers are required to receive their care from physicians designated by the employer or by an insurance company acting in the employer's behalf. Only nine states give the employee primary choice of physician.* The legislation itself reveals misgivings over the possible consequences of exclusive employer designation. Many states provide escape clauses: if the employer fails to furnish care; if major surgery or dismemberment is involved; or if "there is reasonable ground for believing that the life, health or recovery of the employee is endangered. . . ." [8]

There are other grounds for concern. Doctors engaged by employers and insurance companies have tended to find in a manner which reduces liability for cash compensation, just as employee-

* Massachusetts, New Hampshire, New York, Ohio (in cases handled by the state fund only; the employer makes the choice if self-insured), North Dakota (by statute choice is assigned to state fund but employees are actually permitted to choose doctors), Rhode Island, Washington, West Virginia, and Wyoming.

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This paper was presented before a Joint Session of the Medical Care and Industrial Hygiene Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 13, 1954.

chosen doctors have tended to support claims for greater benefits.[9] Doctors are often chosen with an eye to their potential performance on the witness stand.[10] They study forensic technics, such as avoiding direct references to medical records lest they be required to introduce the complete record in evidence.[11] While some doctors maintain a high degree of objectivity, others are completely partisan. The Council on Industrial Health of the AMA released a study of "Medical Relations Under Workmen's Compensation in Illinois" which reports instances of doctors: "whose main source of income is examination for testimony and reports. . . . They are deliberately partisan and for this reason, testify in the great majority of cases. . . . Their testimony ranges from deliberate perjury to undue shading by the use of such phrases as 'mild' instead of 'marked'. . . [Some doctors] do not have any difficulty in substantiating by clinical findings their absurdly high or low disability evaluations." [12]

Fearing adverse testimony, patients sometimes become uncooperative in the very process needed for their recovery. The manager of health services of the General Electric Company has deplored the: "poor cooperation on the part of the injured . . . manifested by an evasive history or in an attitude of passive resistance. . . . Occasionally the injured may refuse to have essential laboratory work done excusing his action by stating that he doesn't want to have any needle punctures or that he would prefer to see his own doctor. . . ." [13]

Often the injured worker does not know whom to trust; his "own" doctor and attorney who may be urging a claim of complete disability which would preclude rehabilitation, or the company doctor who may be withholding information about the true extent of his injury. The only acceptable alternative to impartially administered medical care is triplication, in which employers and employees hire doctors and the administrative agency engages other doctors to arbitrate the conflicting claims. Apart from the unedifying clash of conflicting medical testimony, an adversary-oriented system of medicine does irreparable harm to the quality of care.

Quality of Care, Methods of Payment, and Organization of Services—In the early benefit provisions, the word "quality" probably did not once appear in relation to medical care. The legislation has not, in fact, undertaken to provide medical care of the highest available quality. Instead, it often limits fees to those prevailing "in the same community for similar treatment of injured persons of a like standard of living." [14]

Standard of care corresponding to a worker's standard of living is subject to interpretation. In some states, for example, hospital accommodations are at the semiprivate standard; in others injured workers are ward patients; or the rates may not exceed modest daily amounts prescribed by regulation and occasionally even set by law. At a time of rapidly rising costs, inflexible maximums may either depress the level of care or impose a hardship on the hospital.

Most medical care under workmen's compensation is purchased on a fee-for-service basis. Insurance companies and state funds pay for about 85 per cent of the care; the rest is provided by employers on a self-insured basis. The usual setting is one of private practice, but the fees are prevailingly lower. In Nebraska, for example, the fee schedule is the one used by public agencies and the physician is reminded: "that this is not a schedule for private practice." [15] Perhaps this has no influence on the care received by injured workers, but if economic incentives operate at all in the health care field, there is the possibility that substandard fees may expose workmen's compensation patients to substandard care.

For many years, workmen's compensation practice was not regarded as desirable by physicians,[16] and there was a tendency to put injured workers into wards for free surgical service,[17] but there has been considerable improvement. The problem is not simply one of raising fees. Present fee levels have not prevented some rings of lawyers and doctors from making a very profitable business of practicing poor medicine on a wholesale basis; subjecting workers to—as one investigation reported it—"inefficient treatment, overtreatment and even to unnecessary and harmful operations." [18] The overriding problem is lack of organizational controls on quality. There is little supervision by industrial boards and commissions; they generally are not authorized to interfere unless abuses have been reported.

Some employers maintain excellent in-plant medical departments offering not only a high grade of treatment, but devoting a substantial portion of their resources to the general health maintenance of the work force. However, self-insurance of medical care accounts for only 15 per cent of the total care and its prevailing quality is difficult to assess.[19]

The extent to which insurers have attempted to establish controls on the quality of care depends often on the conscientiousness of the individual claim adjuster. It also depends on the volume of compensation business. One of the largest insurers, for example, has a policy of promoting a high quality of care including rehabilitation. It maintains panels of medical advisers who help the company choose qualified physicians. They review periodically case records in severe injuries and if they question whether proper care is being provided, they are in a position to make suggestions and at times to propose other arrangements. But this is exceptional.

A procedure of this type presupposes a degree of organization that is often precluded by the small volume of insurance written by many companies. Without a substantial premium volume, the companies cannot afford to make the arrangements for medical care which have to be made locally with doctors, hospitals, rehabilitation centers, and which must be continually reappraised and renewed. Yet, in many states the annual workmen's compensation premium of most insurers is less than $100,000—which means an allocation of $20,000 or less for medical care, a small amount with which to operate a satisfactory medical care program.[20] The emphasis in many companies both large and small is dominated by the handling of cash claims. Whether the arrangements needed to assure care of reasonable quality are actually made is open to serious doubt.

Although the prevailing quality of care has improved with the times, the Illinois report spotlights the areas that still need correction: "The principal weakness in quality of care appears to arise out of the care immediately following the injury. Ignorance of pathology, professional pride, production requirements and misguided efforts to keep costs down are the principal contributing factors. There are too many supervisors reluctant to refer the employee to the medical department . . . too many nurses who consider themselves qualified to practice medicine. . . . Perhaps the greatest fault of all is with the doctors who do not acknowledge their own professional limitations. . . . As a result, cut tendons, fractures and foreign bodies are overlooked; infections occur; head and internal injuries, particularly following falls are treated asymptomatically without a careful inquiry into more serious and complicating issues." [12]

Relation to Voluntary Health Insurance—There is a "twilight zone" between injury and disease and between occupational and nonoccupational conditions. When workmen's compensation stood

alone as the major prepaid medical care program, it often was accused of covering nonoccupational conditions. Today, the same employment from which an employee derives entitlement to compensation is also the basis for participation in voluntary health insurance for himself and his family. A "black market" usage of voluntary health benefits in industrial cases has sprung up. Employees are often entitled to larger cash benefits for nonoccupational disability than for occupational injury. Workers may prefer to receive hospital and medical care in a community rather than an industrial setting. Some employers covertly recommend filing for insurance rather than compensation as it improves the safety record and reduces compensation costs.

Now that voluntary health insurance is growing to adult proportions, in coverage if not in comprehensiveness—covering some three out of five in the population [21]—the relationship between prepaid care for occupational and for nonoccupational conditions becomes more significant. With few exceptions, voluntary health plans have taken an independent line of development apart from workmen's compensation and generally try to exclude work injuries, although the separation is arbitrary and at times unenforcible. Coordination will become increasingly necessary as general health care insurance approaches the comprehensiveness of compensation benefits. Splitting care into occupational and nonoccupational compartments reduces its quality, as either segment alone is incomplete and general medical care often misses the occupational origin of disease. Where general medical care is organized in such a fashion as to assure high quality care of adequate comprehensiveness it may offer the needed setting which combines impartiality, competence, and a primary focus on the welfare of the individual.

## Rehabilitation

Rehabilitation is not one technic or a medical specialty, but a composite of all disciplines dedicated to the conquest of disability. It is directed not merely to making the disabled person employable, but also to help him live with his family and in his community. By the only historically acceptable standard rehabilitation is not a recent miracle but the aggregate of means available at any given time for restoring disabled people to optimal physical, mental, social, and economic well-being. Acceptance of this heroic goal is recent, as is the great progress in the effectiveness of rehabilitation. The "miracles" are simply that at this stage of human development the legless can be helped to walk, the armless to perform work with remarkable dexterity, the paralyzed can be restored to active life, and equally inspiring results can be achieved with a great variety of handicaps that formerly had had to be accepted as totally disabling.[22-27]

This development was bound to become one of the major goals of the compensation process. Some authorities regard rehabilitation as the aim of compensation, embracing even the cash benefits under the broad concept of "economic rehabilitation." [28] But although rehabilitation is essential to proper compensation, it is not a part of workmen's compensation in most states and is not even reasonably well coordinated with compensation.

The present federal-state rehabilitation system had its beginnings in state programs to meet the needs of the occupationally disabled, but it has broadened into a nation-wide system extending far beyond the work injured group. Most compensation agencies are committed to cooperate with this program rather than operate their own.

As a result, only four states—Ohio,

Oregon, Rhode Island, and Washington—and Puerto Rico—directly operate rehabilitation facilities under workmen's compensation sponsorship. A few states, probably five, finance or help pay for rehabilitation as a direct part of workmen's compensation. Fifteen states facilitate rehabilitation by providing limited maintenance allowances during its progress. In all, only 17 states have made any statutory provision under workmen's compensation to provide or facilitate rehabilitation. Most of these provisions are far too circumscribed for adequate maintenance during rehabilitation or to assure the services for the period required.

Volume of Rehabilitation—The Labor Department and the Office of Vocational Rehabilitation have estimated that at least 200,000 of the nearly 2,000,000 workers injured each year could benefit from such services as physical therapy, functional therapy, and other technics of rehabilitation. By a more urgent standard, some 12,000 workers injured in employment each year face a substantial handicap without additional services, such as vocational guidance, training, and placement.[29] But the hard facts are that in the fiscal year 1953 only 5,512 occupationally injured persons were rehabilitated under the federal-state program; of them only 3,693 were workmen's compensation cases; and of these the majority had not currently become disabled but were part of the vast backlog of unmet rehabilitation needs.[30] Compensation officials have estimated that "only 3 per cent of the injured workers in the United States are receiving the type of service needed." [31]

Rehabilitation facilities and personnel are scarce. A recent compilation of "Rehabilitation Centers in the United States" lists a total of 43 centers. Additional facilities are operated by hospitals and medical schools, but out of 1,600 hospitals responding to a survey in 1951 only 65 operated organized rehabilitation services; the number with bed allocations for this purpose was 18 and in some of these the services were not comprehensive.[32]

The 43 centers, moreover, are located in only 22 states. As a result, rehabilitation often requires interstate travel. Workers from North Carolina most frequently go to Virginia. Ohio workers travel to New Jersey. From South Carolina, travel is reported to Boston. From Alaska, the center most often used is located in California. It seems that we have far indeed to go to catch up with the Baruch Committee recommendation for mobile clinics to bring rehabilitation to patients.[33] "The urgent need for more trained personnel . . ." in all fields has been repeatedly demonstrated.[34]

Some improvements are to be expected as a result of the great awakening of interest and such recent legislation as the 1954 Amendments to the Vocational Rehabilitation and to the Hospital Survey and Construction Acts. On the basis of these changes it is hoped that workmen's compensation cases handled annually under the federal-state program will reach 12,000 by 1959.[35]

Coordination of Compensation and Rehabilitation—There is some question whether this trebling of the present volume of workmen's compensation rehabilitation can be achieved without far-reaching changes within workmen's compensation itself. Compensation agencies have concentrated on improving the mechanics of referral for rehabilitation. The referral system certainly needs improvement, but the problem is much deeper.

The Task Force on the Handicapped has revealed that it took seven years on the average for injured workers to find their way to the federal-state program in 1951.[37] This statistic in effect indicates that in the average compensation case rehabilitation is not being sought until workmen's compensation no longer

holds any hope for the injured worker.

There are many motivations under workmen's compensation to settle cases quickly by lump sum payments rather than to go through a protracted and expensive course of rehabilitation. But quick settlements assume a finality that may not be justified by the disability itself. A quick settlement is convenient for the employer as it settles his liability; for the insurer, as it closes the claim; for the lawyer, as it pays his fee promptly; for the administrative agency, as it disposes of the case; and workers, too, occasionally press for a cash settlement, although it is decidedly not in their best interests.

Employee motivations for adequate cash compensation are often disparaged, but rarely understood. The legislation was intended to provide economic security. If an injured employee wants economic security, he is hardly out of step with most other people, and having sustained an injury he may well have special grounds for anxiety.

It is generally accepted as a truism that a worker who has been rehabilitated is "better off" than one who has not, but this has not been demonstrated to the injured person and indeed it is not invariably true under present circumstances. Rehabilitation practice is still far removed from its high aims. The best prosthetic device leaves the worker with a 24-hour lifetime loss that cannot be fully indemnified by a wage loss benefit based on an eight-hour working day. At best, cash compensation benefits are not munificent. The probability is that, all told, cash benefits in severe injuries do not repay more than a third of average wage losses.[38, 39] Thus, even if the employee demonstrates that he has been very severely injured, he is not assured of a reasonable cash award. If he minimizes his own disability through rehabilitation his cash benefits are reduced. To him rehabilitation is an unknown factor the advantages of which are difficult to assess. Even if he accepts it, he may later find himself out of employment and unable to find other positions because of his handicap. Accordingly, many employees hold out for the more tangible security of a larger cash award or even a permanent pension.

A growing number of authorities are now aware that the incentives under workmen's compensation are wrong—that they stress disability, rather than the effort to resist it. But the changes required to build incentives for rehabilitation into workmen's compensation will require a major rethinking and recasting of the legislation. Incentives for rehabilitation can be built into workmen's compensation, but rehabilitation must be greatly expanded and new safeguards are needed, including provision for reopening unsuccessful cases in order to give workers assurance that rehabilitation is not merely a device to cut their cash benefits.

## Conclusion

Workmen's compensation is a metamorphic form of legislation—part employers' liability act, part disability insurance program—that has not yet developed into a modern system of dealing with industrial injuries and diseases.

Administrative weaknesses, inherited from earlier laws, have continued to pit employer and employee in a contest carried on not only in the claim office, the hearing chamber, and in the state legislature but, unfortunately, also in the hospital, clinic, and doctor's office.

The medical benefits were modestly and perhaps incorrectly conceived—as if the basic problem were to devise another set of cash benefits devoted to paying doctors and hospitals, rather than to assure proper medical services and impartial diagnosis as a central part of the compensation process.

The President's Commission on the Health Needs of the Nation has recommended that: "State workmen's compensation laws be improved so that they provide coverage of all occupations, adequate medical care including rehabilitation, coverage for all injuries and diseases arising from occupational exposure, and assurance of impartial medical diagnosis with a minimum of legalistic procedures." [40]

Present arrangements for care fail to meet this standard on many counts. Public investigations have from time to time erupted with adverse findings. But such investigations tend to be made when there are known abuses. There needs to be a broad investigation of the quality of care not primarily to track down abuses, but to blueprint ways that medical care can be organized at the plant and in the community to assure competent and impartial care.

Rehabilitation should be made available through workmen's compensation to all who need it. It should be paid for by workmen's compensation and thus guarantee entitlement to the employees and provide a more assured financial base for the services.

Once rehabilitation becomes a part of workmen's compensation on a large scale, its impact on the total program will be immeasurable. Disabilities can be compensated by a more flexible and realistic plan. Greater use of individual determinations of disability will become possible—and indeed imperative—rather than the present widespread resort to arbitrary and anachronistic schedules and presumptions of permanency. Workmen's compensation in its entirety needs this kind of clinical base. It can begin most appropriately in the medical wing of compensation.

Society has assigned to workmen's compensation the task of bringing to bear on the problem of occupational injury the elements of prevention, cash benefits, medical care, and rehabilitation—in short to do more than any other insurance program, whether social or private, compulsory or voluntary. The practical groundwork to accomplish this prodigious task has so far not been laid. As Thoreau urged in his conclusion to "Walden": "If you have built castles in the air, your work need not be lost; that is where they should be. Now put the foundation under them."

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## Venereal Disease Is on the Rise

For the second successive year a joint statement of three national agencies has sounded an alarm about the rising incidence of venereal disease. The American Social Hygiene Association, the American Venereal Disease Association, and the Association of State and Territorial Health Officers, on the basis of reports from 48 states and 44 large cities, believe there is "manifest grave danger in the present venereal disease situation."

Among the findings are that the rates of syphilis and gonorrhea, or both, are currently rising in 43 states. Serious VD epidemics have broken out in 18 states and eight major cities. In 1953 one out of every 200 teen-agers contracted gonorrhea.

Because of these conditions, the three agencies recommend that the federal government provide $5,000,000 in fiscal 1956 to permit replacement of personnel lost because of 1954 and 1955 cuts and support emergency activity needed to check the increasing incidence. Such a sum would allow for continued grants and technical assistance for case finding and other epidemiologic services and for continued recruitment and training of venereal disease investigators. The federal government is further urged to assist the states in detailed survey of venereal disease control needs. The joint statement is illustrated with a map and set of eight charts that dramatize the need for case finding.

# A Study of Factors Affecting the Neurologic Status of Young Children

## I. Plan of Study and Some Neonatal Findings

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***Outlined here is a research plan for a long-term (seven or more years) follow-up study of a group of newborn infants for whom detailed information has been recorded about conditions during delivery and the findings of oxygenation readings during the first half hour of life.***

One of the foremost challenges facing public health is the incidence of birth injuries and neonatal deaths. In the search for physiologic explanations of these disorders, many aspects have been investigated separately.

Barcroft [1] showed that the sheep fetus remains relatively anoxic throughout gestation. Rosenfeld and Snyder [2] found that the respiratory movements normally present in the near-term rabbit fetus could be so depressed by anesthesia administered to the mother that, if delivered at that time, the onset of respiration either failed or was much delayed. Eastman [3] determined the mean arterial oxygen saturation of 15 human umbilical vein blood samples to be 50 per cent as compared with the adult normal of 95 per cent. Smith [4] and Taylor [5] separately using a microcolorimetric method obtained serial arterial oxygen saturation values during the first four hours of life on 31 and 94 newborns, respectively. Both concluded that the arterial oxygen saturation of newborns gradually rises so that values within the normal adult range are sometimes reached in less than 30 minutes after birth and usually within three hours. It has been indicated that the premature baby's arterial saturation rises more slowly.[6]

That obstetrical anesthesia can depress cord blood oxygenation to extremely low levels causing asphyxia of the newborn was first shown by Eastman.[7]

Watts [8] has demonstrated a significant fall in cord vein oxygen saturation related to each of the following conditions: heavy analgesia to the mother in labor; major obstetrical maneuvers such as mid forceps, breech, or version and extraction deliveries; or prolonged second stage of labor.

The relative importance of fetal anoxia during delivery in the production of the immediate and late evidence of brain injury is still unsettled. The present consensus can be briefly summarized as follows: (1) frequently, prolonged anoxia is the cause of death and brain damage in the neonatal period; however, in the great majority of cases the signs of injury subside and disappear completely during the first two weeks of life; (2) only rarely will all signs of central

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This paper was presented before a Joint Session of the Epidemiology, Maternal and Child Health, and Statistics Sections of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 12, 1954.

nervous system injury remain latent during the newborn period and become manifest later on.[9–11]

To date research in this field has been compartmentalized. In physiologic studies with good chemical data no follow-up of the babies has been made to determine outcome, and often the number of chemical determinations has been too small for statistical significance. On the other hand, follow-up studies of potentially or definitely injured babies and the retrospective studies of like groups have not been prefaced with chemical data to help define the degree of anoxia present at birth. It was with the aim of bridging the gap between these two types of studies that the Buffalo Children's Hospital Child Growth Study was set up in 1948.

The Departments of Pediatrics and Obstetrics in the University of Buffalo School of Medicine and the New York State Department of Health together initiated the project. The table of organization called for the New York State Department of Health to supply the financial support and statistical help, the Children's Hospital and the Department of Pediatrics to supply office and laboratory facilities, as well as the medical personnel, and the Department of Obstetrics to arrange permission for the study group to observe any and all deliveries in the Children's Hospital. Each of the three has maintained active interest in the study and frequent valuable intergroup conferences have been held through the years.

## Plan of the Study and Methods Used

The study was planned to evaluate factors, such as genetic influences, trauma to the central nervous system, anoxia, and other possible noxious influences acting on gestation, delivery, the neonatal period, and the preschool child. Each newborn infant on the study was to be followed closely in the nursery and periodically thereafter until the existence of permanent neurologic sequellae had been definitely established or eliminated.

Most babies admitted to the study were born at the Children's Hospital. The Maternity Division of the Children's Hospital is a private service drawing patients from this general metropolitan area. This group of patients has not given us a true cross-section of the population because it consists largely of the stable, somewhat above average socioeconomic element. This immediate bias was accepted because it gave us a more reliable group which was thought to be preferable for a long-term follow-up study.

In practice, the study physician's first contact with a case was in the delivery room. Cases were not taken at random. Caesarean sections, inductions, labors of long duration, and other potential or definite problem cases were taken preferentially. The great majority of cases were, for convenience sake, those delivering between 9 a.m. and 5 p.m. Data were recorded from the mother's hospital chart concerning age, duration, and relative difficulty of labor; amount and time of analgesics during labor; when the membranes ruptured; and when the second stage of labor began. The exact time when anesthesia began was recorded and the rest of the delivery closely observed, time intervals being kept by stop watch. Accurate determination of the type and difficulty of delivery, the appearance of the baby, the time of the first cry, and details of resuscitation were possible by direct observation by the study physician and on-the-spot questions to the obstetrician.

Before or shortly after the baby's first cry a 12-inch length of umbilical cord was doubly clamped, divided, and given to a technician, who then drew off arterial and venous blood samples for chemical analyses. As soon as the baby's condition permitted and it had been weighed and shown momentarily to the

father, it was taken to a nearby room where an oximetry earpiece was attached and a continuous 30-minute record of arterial oxygen saturation obtained on a film strip. The baby was then carefully measured and examined before being taken to the nursery. The placenta was weighed and inspected for infarcts, calcifications, edema, and abnormality of cord insertion. One or two days following the birth the physician described the study to the mother to enlist her cooperation in the follow-up of the baby.

About a third of the parents did not wish to participate and were temporarily dropped from the study with the plan that they would be contacted again later. From those who expressed a willingness to join, a careful history of familial illnesses; previous pregnancies; and diet, weight gain, illnesses, and injuries during this pregnancy was obtained. This history was later supplemented by a report from the obstetrician. The neonatal aspects of the study were completed by pelvic x-rays of the mother, periodic examinations of the baby in the nursery, and an electroencephalogram of the baby before discharge.

The follow-up examinations are scheduled at 6, 12, and 18 months, and at 2, 3, 4, and 5 years, with a final evaluation between 7 and 9 years of age. The 18-month visit includes only a psychologic examination. All other visits include a physical examination, psychologic examination, and an electroencephalogram. The physical examination emphasizes the appraisal of physical and neurologic growth and development. The physician also obtains a cumulative history of immunizations, illnesses, and injuries since the preceding visit. The Cattell test form is used through the 18-month psychologic examination and the Stanford-Binet thereafter. In addition, the psychologist spends considerable time discussing the child with the parent to ascertain details of family life, development, training difficulties, and emotional problems.

Some exceptions to the above procedure must be discussed. Three babies were not born in the Children's Hospital. One was delivered after its mother's death, another was born of a mother who contracted poliomyelitis during the sixth month of gestation, and the third was an asphyxiated baby transferred to our hospital. Occasionally, definite problem cases or younger siblings of children already on the study were included, although their deliveries had not been observed. In all these cases no oxygen saturation studies were possible.

### Details of Laboratory Procedures

Cord Blood Determinations — The blood samples were collected anaerobically from the cord vein and artery in heparinized syringes containing a drop of mercury. The syringe tips were capped and the syringes shaken and refrigerated immediately. The chemical determinations were made within 24 hours. Van Slyke manometric gas analyses,[12] usually run in duplicate, gave cord vein and artery $O_2$ capacity, $O_2$ content, and $CO_2$ content values. From these values the per cent $O_2$ saturation [12] and partial pressure of $CO_2$ [13, 14] could be determined. The cord vein pH was determined on whole blood by a Cambridge instrument pH meter with a micro-McInnes glass electrode.

Earpiece Oximetry—Earpiece oximetry is a method for obtaining multiple arterial saturation values without the necessity of drawing blood or performing laborious Van Slyke analyses. Oximetry is based on the differences in transmission of light by oxygenated and reduced hemoglobin which occur in the red and infrared areas of the spectrum.[15] The relative absorption of each is determined photoelectrically by the oximeter earpiece which is placed on the intact pinna of the ear. The blood in the ear is interposed between a source of light

**Table 1—Number and Per cent of Live Births in Total Hospital Experience and Study Group by Type of Delivery, Children's Hospital, Buffalo, N. Y., 1949–1953 Inclusive**

| Type of Delivery (1) | Total Hospital Experience | | Study Group | |
|---|---|---|---|---|
| | No. of Live Births (2) | Per cent of Live Births | No. of Live Births (3) | Per cent of Live Births |
| Total | 12,829 | 100.0 | 858 | 100.0 |
| Spontaneous | 1,293 | 10.1 | 58 | 6.8 |
| Low Forceps | 9,437 | 73.5 | 502 | 58.5 |
| Operative Forceps | 837 | 6.5 | 67 | 7.8 |
| Breech Delivery | 469 | 3.7 | 62 | 7.2 |
| Version | 311 | 2.4 | 34 | 4.0 |
| Caesarean Section | 482 | 3.8 | 135 | 15.7 |

(1) Children's Hospital Classification
(2) Calendar years 1949–1953 inclusive
(3) Admitted to study September, 1949–December, 1953, inclusive

and two iron-selenium photoelectric cells, one receiving red light and the other infrared light.

On the study the outputs of these cells are measured on two separate galvanometers. The galvanometer deflections are recorded permanently on photokymographs.[16] As described by Wood, the calculations were made from the photokymograph records using the formula $\frac{\text{Log } (R_o / R_n)}{\text{Log } (IR_o / IR_n)}$, in which $R_o$ is the galvanometer deflection of the red photoelectric cell when the ear is bloodless; $R_n$ is the galvanometer deflection of the red cell when the ear is blood-filled; and IR is the infrared.

Oxygen saturation was read from the appropriate calibration curve for the earpiece used. The earpieces used by the study were two Wood-Geraci "absolute reading" oximeter earpieces as made by the Waters Conley Company. These instruments were calibrated on white infants of less than 3 months of age by plotting simultaneous Van Slyke and photoelectric determinations of arterial oxygen saturations. Arterial samples were obtained during rest, crying, and while breathing gas mixtures of from 8 to 100 per cent oxygen concentration.

## Neonatal Findings

Prior to September, 1949, 71 deliveries were observed in order to standardize the various procedures. Although records were obtained on these deliveries, they are not included here. Two stillbirths whose deliveries were observed were also excluded because no laboratory work was available and no follow-up would be possible. These data are based on 858 infants who were taken into the study between September, 1949, and December, 1953. At the present time, we are unable to present any findings based on follow-up examinations and are confining ourselves to some preliminary neonatal laboratory findings.

For many years data regarding deliveries at the various hospitals in the city of Buffalo have been collected. Some of these data for Children's Hospital [17] are shown by type of delivery in Tables 1 and 2. The preferred method of delivery at this hospital is low forceps, comprising 74 per cent of the total hospital deliveries for the period 1949 through

**Table 2—Neonatal Mortality Among Live Births in Total Hospital Experience and Study Group, Children's Hospital, Buffalo, N. Y., 1949–1953 Inclusive**

| Type of Delivery (1) | Total Hospital Experience | | | Study Group | | |
|---|---|---|---|---|---|---|
| | No. of Live Births (2) | No. of Neonatal Deaths | Per cent Neonatal Mortality (3) | No. of Live Births (4) | No. of Neonatal Deaths | Per cent Neonatal Mortality (3) |
| Total | 12,829 | 179 | 1.4 | 858 | 17 | 2.0 |
| Spontaneous | 1,293 | 42 | 3.2 | 58 | 4 | 6.9 |
| Low Forceps | 9,437 | 63 | 0.7 | 502 | 4 | 0.8 |
| Operative Forceps | 837 | 11 | 1.3 | 67 | 2 | 3.0 |
| Breech Delivery | 469 | 38 | 8.1 | 62 | 3 | 4.8 |
| Version | 311 | 11 | 3.5 | 34 | 0 | 0.0 |
| Caesarean Section | 482 | 14 | 2.9 | 135 | 4 | 3.0 |

(1) Same as Table 1, footnote 1
(2) Same as Table 1, footnote 2
(3) Deaths occurring prior to discharge from hospital, generally within one week of delivery
(4) Same as Table 1, footnote 3

1953. Table 1 shows the bias of the study group when compared to the total hospital experience by type of delivery. The study group has relatively fewer spontaneous and low forceps deliveries and relatively more pathologic deliveries: namely, operative forceps, breech deliveries, versions, and Caesarean sections. Statistically, these differences are highly significant and this precludes any generalization to the total hospital experience from the total study group.

Table 2 compares the mortality of the study group with the total hospital experience within delivery groups. Although differences exist within delivery groups, none of them is statistically significant. It should be noted that the rates for some of the delivery groups in the study are subject to considerable variation, being based on relatively small numbers. The selection of potentially pathologic deliveries for observation did not result in selecting subgroups with significantly higher hospital mortality experience.

Because anoxia is thought to be one of the leading causes of neurologic injury in the newborn, the quantitative measures of oxygenation were examined first. The remaining tables show the cord vein and earpiece oximetry $O_2$ saturation data for various subgroups in the study.

Because of the small numbers of patients within the delivery subgroups shown in Tables 1 and 2, the data were tabulated for three delivery groups only: (1) Low forceps—this differs from the low forceps group in Tables 1 and 2, due to the removal of 90 low forceps deliveries with rotation; (2) Caesarean section—this group is the same as that shown in Tables 1 and 2; and (3) all other types of delivery—includes the 90 low forceps cases with rotation.

Table 3 indicates the mean oxygen saturation values by type of delivery, the number in parenthesis indicating the number of infants in each group. The line of figures opposite "Number of Cases" indicates the number of infants for whom data were obtained. For example, of 412 infants delivered by low forceps, cord vein values were obtained for 285. The same tabular pattern is used throughout.

The cord vein values are derived from single specimens. They represent instantaneous values which are subject to considerable variation within any given patient, and consequently should be inter-

**Table 3—Per cent Oxygen Saturation of Newborn Infants by Type of Delivery Among Study Group, Children's Hospital, Buffalo, N. Y., 1949–1953 Inclusive**

| Type of Delivery | Cord Vein | Earpiece Oximetry | | | | |
|---|---|---|---|---|---|---|
| | | 4–6 Min. | 9–11 Min. | 14–16 Min. | 19–21 Min. | 24–26 Min. |
| Low Forceps (412) | | | | | | |
| Number of Cases | 285 | 51 | 132 | 142 | 146 | 132 |
| Mean Per cent Saturation | 54.9 | 76.3 | 83.5 | 86.0 | 88.3 | 88.6 |
| Standard Error of Mean | 1.0 | 1.3 | 0.8 | 0.9 | 0.8 | 0.8 |
| Caesarean Section (135) | | | | | | |
| Number of Cases | 110 | 13 | 60 | 71 | 77 | 69 |
| Mean Per cent Saturation | 38.1 | 71.5 | 83.8 | 85.2 | 88.4 | 89.2 |
| Standard Error of Mean | 1.8 | 6.7 | 1.5 | 1.1 | 0.9 | 1.1 |
| All Others (311) | | | | | | |
| Number of Cases | 199 | 32 | 99 | 127 | 132 | 122 |
| Mean Per cent Saturation | 52.8 | 75.7 | 82.5 | 87.4 | 89.5 | 90.8 |
| Standard Error of Mean | 1.2 | 3.2 | 1.4 | 0.9 | 0.9 | 0.8 |

preted with caution. The mean cord vein $O_2$ saturation for the low forceps group is 54.9 per cent, for the Caesarean sections 38.1 per cent, and for all other deliveries 52.8 per cent. The mean cord vein oxygen saturation for the preferred type of delivery corresponds closely to that reported by Eastman [3]: namely, 50 per cent. The mean value for caesarean sections differs significantly from the mean for each of the other groups, whereas the other groups do not differ significantly from each other.

The oximetry readings at the various time intervals are deficient in numbers because equipment for this technic was not available for the first 200 cases. For the remaining cases the most common cause for failure to obtain readings was dislodgement of the earpiece by a hyperactive infant. Relatively fewer readings are available during the period 4–6 minutes following delivery because the procedure requires a minimum stabilization period of 3 minutes before any readings can be made, and approximately one-third of the infants in the study required some resuscitation.

Despite an initial difference in cord vein oxygenation, the infants in the three groups have similar mean oxygen saturations in the ensuing time intervals. It is interesting to note that the mean value for each group approaches the normal adult arterial oxygenation (95 per cent) by 24–26 minutes, substantiating the independent conclusions of Smith [4] and Taylor.[5]

At this point, it seemed desirable to examine the oxygenation of the Caesarean sections in two groups: elective sections, and those performed for definite pathologic indications. Pursuing this line of inquiry, it was found that the oxygenation of the cord vein did not differ significantly for these two groups, and the Caesarean sections are hereafter considered as one group.

The relationship between the mean cord vein values found in Table 3 raised another question: does any association exist between these findings and the type of anesthesia used? These data are presented in three parts: deliveries with spinal anesthesia only (Table 4-A); deliveries with spinal anesthesia and some other anesthesia (Table 4-B); and deliveries with other anesthesia but no spinal anesthesia (Table 4-C). [Chloroform was the only anesthetic used for over 90 per cent of the deliveries classified as "Anesthesia Other than

Spinal" in Table 4-C.] Three deliveries with no anesthesia are not included in these tables. The small number of infants observed in each group prevented any further subdivision as to type of anesthesia.

One might question the reliability of the mean and the standard error of the mean where a small number of independent observations are involved. They are included primarily to show the consistency of the oximetry pattern among the delivery-anesthesia groups.

Examination of the findings in Tables 4A, B, and C tend to support the previous observation: for each anesthesia group,

**Table 4—Per cent Oxygen Saturation of Newborn Infants by Type of Anesthesia and by Type of Delivery, Children's Hospital, Buffalo, N. Y., 1949–1953 Inclusive**

**A**

**Spinal Anesthetic Alone**

| Type of Delivery | Cord Vein | Earpiece Oximetry | | | | |
|---|---|---|---|---|---|---|
| | | 4–6 Min. | 9–11 Min. | 14–16 Min. | 19–21 Min. | 24–26 Min. |
| Low Forceps (249) | | | | | | |
| Number of Cases | 164 | 31 | 85 | 93 | 95 | 83 |
| Mean Per cent Saturation | 54.4 | 77.8 | 83.8 | 85.7 | 87.5 | 88.0 |
| Standard Error of Mean | 1.3 | 1.6 | 1.0 | 1.3 | 1.1 | 1.2 |
| Caesarean Sections (73) | | | | | | |
| Number of Cases | 59 | 4 | 33 | 43 | 46 | 40 |
| Mean Per cent Saturation | 35.1 | 83.0 | 84.8 | 84.6 | 87.9 | 87.6 |
| Standard Error of Mean | 2.2 | 3.6 | 1.2 | 1.2 | 1.1 | 1.6 |
| All Others (159) | | | | | | |
| Number of Cases | 103 | 21 | 47 | 63 | 67 | 59 |
| Mean Per cent Saturation | 52.3 | 76.0 | 81.2 | 85.9 | 88.3 | 89.7 |
| Standard Error of Mean | 1.7 | 3.3 | 1.8 | 1.5 | 1.5 | 1.2 |

**B**

**Spinal Anesthesia with Other Anesthesia**

| Type of Delivery | Cord Vein | Earpiece Oximetry | | | | |
|---|---|---|---|---|---|---|
| | | 4–6 Min. | 9–11 Min. | 14–16 Min. | 19–21 Min. | 24–26 Min. |
| Low Forceps (9) | | | | | | |
| Number of Cases | 5 | 2 | 4 | 4 | 4 | 3 |
| Mean Per cent Saturation | 42.0 | 72.0 | 85.8 | 88.8 | 88.8 | 90.0 |
| Standard Error of Mean | 9.0 | 5.0 | 5.3 | 2.4 | 2.3 | 3.1 |
| Caesarean Sections (50) | | | | | | |
| Number of Cases | 41 | 9 | 25 | 26 | 28 | 26 |
| Mean Per cent Saturation | 40.5 | 66.3 | 82.4 | 86.0 | 89.1 | 91.5 |
| Standard Error of Mean | 3.4 | 9.2 | 3.1 | 2.1 | 1.8 | 1.3 |
| All Others (14) | | | | | | |
| Number of Cases | 12 | 0 | 4 | 4 | 4 | 5 |
| Mean Per cent Saturation | 46.9 | .. | 84.0 | 88.0 | 91.5 | 86.4 |
| Standard Error of Mean | 3.3 | .. | 7.4 | 5.8 | 3.1 | 9.4 |

**Table 4—(Continued)**

**C**

**Anesthesia Other than Spinal**

| Type of Delivery | Cord Vein | Earpiece Oximetry | | | | |
|---|---|---|---|---|---|---|
| | | 4–6 Min. | 9–11 Min. | 14–16 Min. | 19–21 Min. | 24–26 Min. |
| Low Forceps (154) | | | | | | |
| Number of Cases | 116 | 18 | 43 | 45 | 47 | 46 |
| Mean Per cent Saturation | 56.1 | 74.2 | 82.7 | 86.3 | 89.9 | 89.6 |
| Standard Error of Mean | 1.6 | 2.5 | 1.4 | 1.2 | 1.1 | 1.0 |
| Caesarean Sections (12) | | | | | | |
| Number of Cases | 10 | 0 | 2 | 2 | 3 | 3 |
| Mean Per cent Saturation | 45.7 | .. | 85.0 | 88.0 | 89.7 | 91.7 |
| Standard Error of Mean | 5.3 | .. | 4.0 | 2.0 | 1.3 | 1.3 |
| All Others (135) | | | | | | |
| Number of Cases | 82 | 11 | 47 | 59 | 60 | 57 |
| Mean Per cent Saturation | 54.4 | 75.0 | 83.6 | 88.9 | 90.9 | 92.2 |
| Standard Error of Mean | 2.0 | 7.1 | 2.2 | 1.1 | 0.9 | 0.9 |

the mean cord vein value is lower for the Caesarean sections than for the other types of delivery. Since the type of spinal anesthesia used and levels attained were similar in the low forceps and Caesarean section groups, there appears to be no association between the type of anesthesia and low cord oxygenation of the Caesarean sections. This finding is preliminary and will be examined further in relation to length of anesthesia and administration of oxygen to the mother.

The trend of the mean oximetry values within each delivery-anesthesia group is consistent with that observed in Table 3, with the mean value approaching the normal adult level at the 24–26 minute readings.

## Summary

With the exception of the Caesarean section deliveries, the pattern of neonatal oxygenation is generally one of steady rise from mean cord vein values of approximately 54 per cent oxygen saturation to mean earpiece oximetry values around 89 per cent saturation within 25 minutes.

Caesarean section deliveries are an exception to the general pattern with a significantly lower mean cord oxygen saturation value of 38 per cent. Nevertheless, the oxygenation of sections at 25 minutes of age is similar to that of other deliveries.

The cause and significance of the lower cord vein oxygenation in the Caesarean section group is at present unknown and will be the subject of subsequent study.

ACKNOWLEDGMENTS—The Child Growth Study wishes to acknowledge certain doctors who conceived and initiated these studies: Drs. Edward Bridge, Mitchell Rubin, and Elizabeth Dubs Eberle of the Department of Pediatrics of the University of Buffalo School of Medicine; Dr. Clyde Randall of the Department of Obstetrics and Gynecology of the University of Buffalo School of Medicine; and Dr. Herman E. Hilleboe, commissioner, New York State Department of Health.

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## Roster of Sanitary Engineers

The U. S. Public Health Service is compiling a national roster of sanitary engineers as part of the program of the National Science Foundation to have rosters prepared of all scientific groups essential to the national welfare. The roster will have name, address, professional affiliation, specialty, and other details for each registrant for instant reference in case of a national emergency. Sanitary engineering skills are essential in the defense against atomic or biologic attack and in the development of measures for water supply, waste disposal, shelter, and food sanitation.

The roster now being developed will use a similar roster of sanitary engineers prepared under the Engineering Section Project of the American Public Health Association from 1949 to 1951. It was estimated at that time that there were about 5,000 sanitary engineers in the United States. According to information obtained by the Public Health Service, 95 nationals and an additional 25 persons from other countries received master's degrees in sanitary engineering and only nine were awarded doctorates in 1954.

# Oral Penicillin Prophylaxis of Streptococcal Infections

COMMANDER JOHN R. SEAL (MC), USN

***The findings of a Navy personnel study would seem to apply also to college or school or institutional outbreaks of streptococcal infections. Epidemics can be prevented or quickly terminated by relatively small daily doses of oral penicillin. The inexpensiveness, safety, and effectiveness of this prophylactic measure commend it for civilian as well as military use.***

Because of the lack of other effective control measures, and its reported success in the prevention of recurrent rheumatic fever in civilian groups, investigations into the use of oral penicillin for the prophylaxis of epidemic streptococcal infections among naval personnel were begun in 1951.[1] The initial study demonstrated that a 100,000-unit tablet of oral penicillin once daily was highly effective in preventing men from developing streptococcal infections under conditions of considerable risk. The purpose of this paper is to summarize additional investigations made in Navy recruit populations and to report some previously unreported data. With one exception,[2] all studies in the Navy have been carried out by the Naval Medical Research Unit No. 4.

Commercial buffered tablets of penicillin G have been employed in studies having two general objectives: one, to learn the smallest dose that would effectively suppress epidemics; and two, to learn the smallest dose practicable for use in prophylaxis that would eliminate group A streptococci from a maximum number of carriers. It was foreseen that under some circumstances continuous prophylaxis over a considerable period of time might be necessary. For economic reasons, since the involved populations could number in the hundreds of thousands during full mobilization, the minimum effective dose was sought. It was also thought that it might be possible, under some conditions, to cause a more or less prolonged interruption of an epidemic by a short course of penicillin which would eliminate streptococci from most carriers.

## Experimental

Both controlled studies and experiments with mass prophylaxis have been made. With one exception, all of the studies have been conducted during epidemics of streptococcal infection in the recruit population at a midwestern naval training center:

(a) March, 1951. A total of 320 recruits in four companies were subdivided into three groups in the order of their arrival in training. One group received 100,000 units of oral penicillin, another 250 mg. of chlortetracycline (aureomycin), and the third a placebo, once daily. Administration of the preparations was strictly supervised and the occurrence of streptococcal infections followed by weekly cultures and examination of all men, supplemented by serologic tests. This study has been reported in detail elsewhere.[1]

(b) January, 1952. Men in two companies of recruits were subdivided by alternation from alphabetical rosters. In

midtraining, after a number of men had developed positive throat cultures, one group received 100,000 units of oral penicillin daily for four weeks, the other a placebo. Administration was strictly controlled. Results were obtained by weekly nose and throat cultures.

(c) February, 1952. Men in two companies were subdivided into two groups as in (b). One group received 50,000 units of oral penicillin daily, the other a placebo, for eight weeks. Administration was strictly controlled. Results were obtained by weekly nose and throat cultures.

(d) February, 1952. Two companies experiencing streptococcal infection were selected. Men in one company received 50,000 units of oral penicillin daily, in the other company 100,000 units daily. Weekly nose and throat cultures were obtained. Administration was not strictly controlled, but left up to senior petty officers commanding the companies.

(e) March, 1952. Four companies in the same early week of training were selected. All men in two companies were given 50,000 units of penicillin daily for five weeks. Men in the other two companies received placebos. Weekly nose and throat cultures were obtained from all men. Administration was by company petty officers and not strictly controlled.

(f) March, 1952. Men in four companies experiencing streptococcal infections were utilized. Under strict supervision, two companies were given 250,000 units of oral penicillin twice daily for 10 days, the other two were given placebos. Results were obtained by nose and throat cultures at three- or four-day intervals, serologic studies, and clinical examination of men seeking treatment for respiratory infections.[4]

(g) March, 1952. Mass prophylaxis was carried out in three regiments of recruits, numbering about 4,000 men each. All men in one regiment received 125,000 units (one-half of a 250,000-unit tablet) three times daily for 10 days and were then continued on 125,000 units daily for the remainder of their training or four weeks, whichever was the shorter interval. At the same time, men in the other two regiments were given 125,000 units once daily.

A fourth regiment was subdivided into four groups by assignment of companies in the same week of training into each group. One group of companies received 125,000 units of penicillin three times daily for 10 days and was then continued on 125,000 units daily for a minimum of two and a maximum of four weeks' total prophylaxis, depending on the remaining period of training. A second group of companies received 125,000 units once daily for a similar total period. The other two groups of companies received placebos. Cultures from the nose and throat were obtained from all men seeking treatment of any illness at the regimental infirmaries. Nose and throat cultures were also obtained from all men in 36 companies before, during, and after prophylaxis. Twelve companies were selected in each regiment to provide groups comparable in length of training for this purpose. The post-

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This paper was presented before the Epidemiology Section of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 12, 1954.

From Research Projects NM 005 051.15 and NM 005 051.18, Bureau of Medicine and Surgery, Navy Department, Washington, D. C. The opinions and assertions herein are those of the author and cannot be construed as representing the views of the Navy Department or the Naval Service at large. The use of commerically available products does not imply their endorsement or preference of the products of one manufacturer over similar products which are or may become available from other manufacturers.

prophylaxis cultures were obtained two weeks after termination of penicillin, the men having been absent from the station during the interval. Administration of penicillin was supervised by the senior petty officers commanding the companies.

(h) January, 1953. During an epidemic of streptococcal infections, including scarlet fever at an eastern naval training center, two regiments of recruits, numbering about 2,000 men each, were given courses of 50,000 units of penicillin once daily. One regiment received a single three weeks' course. The other regiment received two courses, one of two weeks and, after a three-week interval, another of three weeks' duration. A third regiment of similar size was given two courses, one of two weeks and, after a six-week interval, another of three weeks' duration of 250,000 units of oral penicillin twice daily. All patients admitted from these regiments because of acute respiratory infections were classified according to the results of bacteriologic and clinical examinations in order to obtain accurate admission rates for streptococcal infections. The incidence of "carriers" was obtained periodically by taking throat cultures on one-quarter of each of the three regiments. This sample was made by selecting every fourth name from an alphabetical roster of the men in each company. Considerable numbers of the same men were cultured before, during, and after prophylaxis by this method. Administration of penicillin was under the supervision of the company petty officers.

(i) April, 1954. Epidemic streptococcal infections occurred in a recruit population totaling about 2,000 men. All recruits, including men arriving from civilian life during prophylaxis, were given 250,000 units of oral penicillin twice daily for 10 days. Admission rates for acute respiratory infections were followed. Nose and throat cultures were obtained from men seeking treatment for respiratory infections and a high percentage of men with febrile respiratory infections were examined and classified. The incidence of streptococcal infections in other populations at the center was negligible and the recruits were fairly well isolated from these other populations. Administration of penicillin was again supervised by company petty officers.

Details of the populations, epidemiologic features, bacteriologic methods, and other methods used in these studies have been reported elsewhere.[1-4]

## Results

In most studies groups of recruits were cultured before and after a variable period of administration of the several doses of penicillin. The purpose was to learn how effective penicillin had been in preventing the development of a positive throat culture, or in converting a positive throat culture to a consistently negative culture. In controlled studies, i.e., (a) through (f), serial cultures were taken at weekly or more frequent intervals and the results are in terms of persistently positive or negative cultures. In mass prophylaxis experiments only the results of single cultures taken before, during, and after prophylaxis were considered. The results of all studies in which these data were obtained are summarized in Table 1.

As tabulated here, the ability of the various doses of penicillin to maintain a negative culture in a man with a negative throat culture prior to prophylaxis was not striking. If the results are compared with the companion placebo group, however, it will be seen that all doses were effective and that there were no marked differences in the several doses in this regard. Studies (a) and (c) were the most significant since, in them, men in the same companies were divided into two groups and were at the same risk. In other controlled studies in which company-to-company comparisons were

**Table 1—Efficacy of Various Doses of Oral Penicillin in Preventing Navy Recruits from Acquiring a Positive Throat Culture for Group A Streptococci and on Converting a Positive to a Persistently Negative Throat Culture**

| Study | Penicillin Prophylaxis | | Throat Culture Originally | | | |
|---|---|---|---|---|---|---|
| | | | Negative | | Positive | |
| | Daily Dose in Units | Duration | No. of Men | Per cent Remained Negative | No. of Men | Per cent Remained Positive |
| (c) | 50,000 | 8 weeks | 62 | 92 | 10 | 30 |
| (d) | 50,000 | 5 " | 62 | 93 | 8 | 38 |
| (e) | 50,000 | 5 " | 112 | 87 | 37 | 43 |
| (h) | 50,000 | 2–3 " | 561 | 90 | 99 | 38 |
| (a) | 100,000 | 6 " | 107 | 98 | 0 | 0 |
| (b) | 100,000 | 4 " | 46 | 93 | 30 | 33 |
| (d) | 100,000 | 5 " | 68 | 88 | 5 | 40 |
| (g) | 125,000 | 2–4 " | 444 | 93 | 112 | 16 |
| | 125,000 | 2–4 " | 697 | 86 * | 321 * | 46 * |
| | 375,000 † | 2–4 " | 208 | 97 | 66 | 7 |
| | 375,000 † | 2–4 " | 355 | 91 * | 195 * | 15 * |
| (h) | 500,000 | 2–3 " | 291 | 99.7 | 108 | 4 |
| (f) | 500,000 | 10 days | 125 | 100 | 30 | 0 |
| (c) | Placebo | 8 weeks | 71 | 69 | 4 | 100 |
| (e) | " | 5 " | 120 | 52 | 37 | 85 |
| (a) | " | 6 " | 107 | 59 | 0 | 0 |
| (b) | " | 4 " | 47 | 85 | 28 | 71 |
| (g) | " | 2–4 " | 227 | 89 | 52 | 21 |
| | " | 2–4 " | 299 | 88 | 116 | 37 |
| (f) | " | 10 days | 120 | 90 | 33 | 82 |

* Any beta-hemolytic streptococcus counted here; in all others only group A counted.
† 375,000 units daily for 10 days, followed by 125,000 daily for rest of period.

made, and the risk varied, the objective was more to observe the effect on positive throat cultures. It appeared that all doses employed had some efficacy in converting the throat culture from positive to negative. It was not until a dose of 375,000 units daily was reached, however, that a marked decline in the incidence of carriers resulted. A dose of 500,000 units daily for 10–21 days eliminated streptococci from the throat culture in 97.2 per cent of the 138 men with positive cultures for group A streptococci prior to prophylaxis.

In 1952 three entire regiments of recruits, numbering about 4,000 men each, were given oral penicillin in daily dosage of 125,000 or 375,000 units (g). A marked reduction in admission rates for acute respiratory infections occurred immediately and persisted throughout prophylaxis. During each of the four days prior to prophylaxis an average of 100 men from the three regiments sought treatment for new respiratory infections. From 37 to 49 per cent of men with respiratory infections reporting at individual regimental infirmaries had positive throat cultures for beta hemolytic streptococci. During prophylaxis the average number of men seeking treatment for new respiratory infections was reduced to 26 per day, with from 7 to 17 per cent having positive cultures. As

seen at the regimental infirmaries, there were no decided differences between the regiment receiving the larger dose of penicillin initially and the two regiments receiving the smaller dose throughout.

In the remaining regiment, in which an attempt was made to conduct a controlled study (g), the results were not conclusive because admission rates from companies receiving placebos also declined markedly when penicillin was started in over three-fourths of the recruit population. Admission of men with respiratory infection and a positive culture for group A streptococci was at a rate of 0.4 men per 100 from companies receiving 375,000 units of penicillin daily, 1.3 per 100 from companies receiving 125,000 units daily, and 4.0 per 100 from companies receiving placebos. The rate of admission of men with respiratory infection and a negative culture during prophylaxis from these three sets of companies, was 2.5, 3.4, and 4.1 per 100 men, respectively.

Further mass prophylaxis studies (h) in 1953 yielded more definitive results. These are summarized in Table 2.

The most dramatic effect was obtained with 500,000 units of penicillin daily. Penicillin was begun on Saturday night, February 7, after four days of administration of placebos heralded as penicillin had failed to prevent an increase in the number of streptococcal infections. On Sunday two patients with scarlet fever and one other patient with clinical evidences of streptococcal infection, but a negative throat culture were admitted. Thereafter, during the two weeks of prophylaxis there were no further patients admitted with either a positive throat culture for group A streptococci or the more typical clinical evidences of streptococcic infection. A majority of streptococcic illnesses prior to prophylaxis were caused by a type 19 streptococcus with scarlet fever being a frequent manifestation. Most of the other infections were caused by a type 1 streptococcus, except during the week immediately prior to prophylaxis when one-fifth of the admissions for streptococcal infection had a positive culture for a type 12 streptococcus.

Subsequent to prophylaxis there was a gradual but steady increase in admissions for streptococcal infections to the preprophylaxis level during a six-week period. Type 19 infections had not regained their former incidence, however, and about half the postprophylaxis infections were due to a type 3 streptococcus which had appeared in the regiment initially in the week prior to prophylaxis. Type 12 and other types present prior to prophylaxis caused only rare infections subsequently. The second course of prophylaxis, begun on April 5, again abruptly terminated streptococcal infections. Admissions for respiratory infections of nonstreptococcal etiology and for rubella were not influenced by either course.[3] Carrier rates for group A streptococci followed admission rates, also evidencing permanent alterations in the prevalence of specific serologic types of streptococci. Confirmed cases of rheumatic fever were not admitted from this regiment in an 18-week period following the end of the first course of prophylaxis, after 12 cases had been admitted in the seven weeks prior to the end of the first course.

Results with a single daily dose of 50,000 units of penicillin in the other two regiments differed considerably from those obtained with the 500,000 unit daily dose. Although admissions for streptococcal infections were markedly reduced, they were not terminated and the relative prevalence of specific types of streptococci was not altered. Carrier rates seemed to be reduced, but to a lesser degree than occurred with the larger dose. The frequency of rheumatic fever also appeared to be reduced.

The recurrence of epidemic streptococcal infections in the recruit regiment receiving 500,000 units daily seemed to

**Table 2—Effect of 50,000 Units of Oral Penicillin Once Daily in Two Regiments of Navy Recruits on Carrier Rates, Admission Rates for Streptococcal Infections, and Number of New Cases of Rheumatic Fever Compared with Effects of 250,000 Units Twice Daily in Another Regiment**

| Week Ending— | First Regiment 50,000 u./Day * | | | | | | | Second Regiment 50,000 u./Day * | | | | | | | Fourth Regiment 250,000 u. b. i. d.* | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Streptococcal | | | | | | | Streptococcal | | | | | | | Streptococcal | | | | | | |
| | Carriers † | | | Cases ** | | | No. Cases R. F. | Carriers † | | | Cases ** | | | No. Cases R. F. | Carriers † | | | Cases ** | | | No. Cases R. F. |
| | Total | 19 | 3 | Total | 19 | 3 | | Total | 19 | 3 | Total | 19 | 3 | | Total | 19 | 3 | Total | 19 | 3 | |
| Jan. 10 | | | | 4.8 | 4.4 | | 2 | | | | 5.2 | 5.2 | | 3 | | | | 3.7 | 3.3 | | 3 |
| 17 | | | | 13.9 | 13.4 | | 1 | | | | 17.5 | 17.5 | | 1 | | | | 16.1 | 16.1 | | 2 |
| 24 | | | | 17.3 | 13.1 | | 0 | | | | 18.9 | 16.4 | | 3 | | | | 16.1 | 14.7 | | 0 |
| 31 | | | | 15.1 | 13.0 | | 1 | | | | 19.2 | 14.8 | | 5 | | | | 15.7 | 12.8 | | 1 |
| Feb. 7 | | | | 11.0 | 6.9 | | 0 | | | | 19.3 | 8.4 | 1.9 | 3 | 32.3 | 11.1 | 0.7 | 29.5 | 14.5 | 0.6 | 2 |
| 14 | 10.6 | 4.1 | | 9.0 | 6.2 | | 0 | 21.1 | 6.4 | 0.5 | 13.8 | 7.9 | | 5 | | | | **0.1** | | | **3** |
| 21 | | | | 11.9 | 9.9 | | 0 | **12.6** | **5.7** | **0.5** | **3.5** | **1.5** | | **1** | **1.2** | | | **0.0** | | | **1** |
| 28 | | | | 7.2 | 6.8 | | 1 | | | | **1.0** | **1.0** | | **1** | | | | 1.7 | 1.7 | | **0** |
| Mar. 7 | | | | 8.0 | 6.0 | | 1 | 8.8 | 2.9 | 2.2 | 2.4 | 2.0 | | 2 | 1.3 | 0.2 | 0.8 | 3.9 | | 3.3 | **0** |
| 14 | | | | 14.3 | 9.9 | 0.8 | 2 | | | | 8.9 | 7.1 | 0.9 | 1 | 6.7 | 1.7 | 3.2 | 7.3 | 2.2 | 2.8 | **0** |
| 21 | 17.7 | 9.5 | 1.5 | 12.4 | 5.6 | 3.4 | 0 | 10.3 | 4.2 | 1.6 | 7.1 | 5.9 | 0.8 | 0 | | | | 11.8 | 5.9 | 2.3 | **0** |
| 28 | | | | **1.9** | **0.4** | **0.4** | **1** | | | | **2.4** | **1.2** | **0.4** | **1** | | | | 14.6 | 6.8 | 6.8 | **0** |
| Apr. 4 | | | | **1.5** | **0.7** | | **3** | **7.1** | **2.9** | **1.5** | **1.0** | | **0.5** | **0** | 19.5 | 3.7 | 8.6 | 21.9 | 8.3 | 9.7 | **0** |
| 11 | **6.5** | **2.6** | **0.8** | **1.0** | | | **2** | **8.1** | **3.3** | **1.6** | **0.9** | **0.9** | | **0** | | | | **1.2** | | **1.2** | **0** |
| 18 | 10.4 | 3.0 | 0.8 | 1.6 | 0.8 | | 0 | 9.4 | 2.6 | 2.2 | 5.9 | 1.3 | 2.9 | 0 | **0.6** | | **0.2** | **0.0** | | | **0** |
| 25 | 9.1 | 2.8 | 0.5 | 2.8 | 1.4 | | 0 | 8.3 | 2.6 | 2.4 | 3.7 | 1.8 | 1.4 | 0 | **1.2** | **0.2** | **0.8** | **0.0** | | | **0** |
| May 2 | 7.5 | 0.7 | 1.5 | 2.7 | 2.7 | | 0 | 8.7 | 2.1 | 3.9 | 3.7 | 1.4 | 2.3 | 1 | 3.2 | 0.4 | 1.3 | 0.0 | | | 0 |
| 9 | | | | 2.9 | 2.4 | | 1 | | | | 3.5 | 2.5 | 0.5 | 0 | 5.4 | 0.6 | 0.9 | 0.8 | | 0.8 | 0 |
| 16 | 2.8 | 0.9 | 0.6 | 1.2 | 0.6 | 0.6 | 0 | 5.5 | 1.1 | 1.7 | 0.5 | | 0.5 | 0 | | | | 2.9 | | 2.9 | 0 |
| 23 | | | | 2.1 | 2.1 | | 0 | | | | 2.7 | 0.6 | 1.9 | 0 | 4.9 | 0.5 | 2.7 | 1.9 | | 1.9 | 0 |
| 30 | | | | 1.0 | 1.0 | | 0 | | | | 0.0 | | | 0 | | | | 3.0 | 1.5 | 1.5 | 0 |

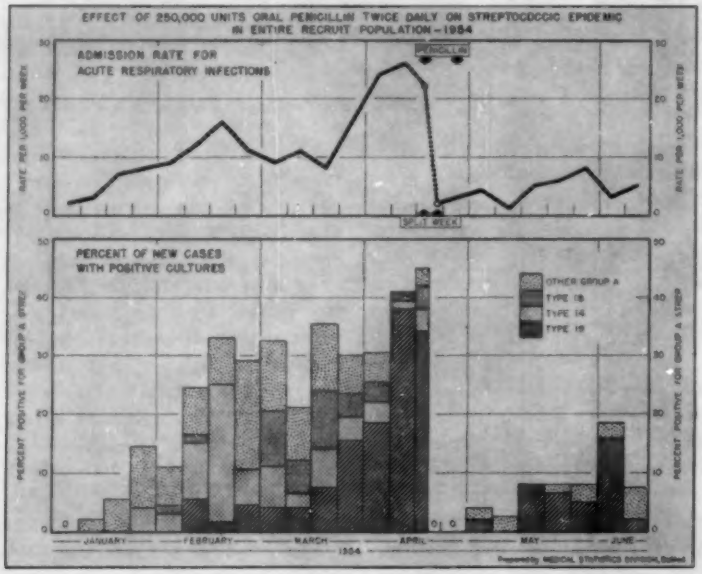
* Weeks in which penicillin was being administered indicated by bold face type.
† Per cent of population carrying group A streptococci (total) and types 19 or 3 only in throat.
** Number of admissions per 1,000 per week for streptococcal infections due to group A streptococci (total) and types 19 or 3 only.

stem largely from sources outside the regiment with men returning from hospitalization or casual contacts with other infected populations on the center playing major roles.[3] In the spring of 1954 opportunity was afforded to treat an entire recruit population with this dose of penicillin under conditions in which the population was reasonably well isolated from outside sources of introduction of new strains or reintroduction of prevalent strains of streptococci. Administration of oral penicillin for 10 days terminated admissions of recruits with positive cultures or clinical evidences of streptococcal infection as abruptly as in the preceding year. This epidemic was also primarily due to a type 19 streptococcus. Type 19 infections rapidly reappeared following termination of prophylaxis (Figure 1) and increased gradually despite the relative lateness of the season.

Rheumatic fever occurred too sporadically in the small population of 1954 to permit analysis of the results of prophylaxis on this sequel of streptococcal infection. The incidence of carriers of streptococci followed that of streptococcal infections, as was demonstrated by the absence of positive cultures from men seeking treatment for illness other than respiratory infections during prophylaxis and the reappearance of type 19 streptococci among such patients immediately following prophylaxis. Types 14 and 18 streptococci, each of which had accounted for about one-third of cases of streptococcic infection earlier in the season, declined in late March when type 19 infections became epidemic and were not found after prophylaxis.

Hypersensitivity Reactions to Penicillin—In all studies men with a history of previous penicillin reactions have been excused from taking prophylactic penicillin. Of the various groups of recruits studied, 50–70 per cent had received penicillin one or more times prior to entry into the Navy and about 2 per

**Figure 1**



cent of the total numbers included in mass prophylaxis experiments were excused because of a previous history of reaction. About half the reactions for which men were excused had occurred from therapeutic penicillin since entry into the Navy. In most studies the diagnosis of medical officers who routinely examined the majority of recruits seeking treatment at dispensaries or infirmaries for any reason was accepted. These medical officers were independent of the investigators and did not know the identity of preparations in studies where placebos were employed. Summarized in Table 3 are the data derived from all mass prophylaxis experiments, including those of another group of investigators.[2] The latter has been included because of the large number of men given a placebo (aspirin).

With few exceptions reactions have been a mild, transient urticaria. Serum sickness type reactions have been uncommon and only a few men have required hospitalization. Anaphylactic reactions have not been encountered. In some instances the reactions have been in men who failed to heed warnings that they should avoid prophylaxis because of a past history of penicillin reaction, but were no more severe than in men with no prior history of reaction. There was no evidence of sensitization of men to penicillin in those studies where courses were repeated. Reactions occurred too infrequently in the smaller controlled studies to warrant tabulation, but one of the severest serum sickness type reactions occurred in a man who had taken only four 50,000-unit tablets.

Penicillin Sensitivity of Group A Streptococci—The sensitivity to penicillin of all strains of beta hemolytic streptococci isolated during these studies has been tested by the method of Frank, Wilcox, and Finland.[5] All those in Group A streptococci have been found sensitive to 0.04 unit or less of penicillin G.

**Table 3—Incidence of Penicillin Reactions During Mass Oral Penicillin Prophylaxis of Streptococcal Infections in Navy Recruits**

| Daily Dose in Units | Duration | Number Treated | Reactions | |
|---|---|---|---|---|
| | | | Number | Per cent |
| 50,000 | 2–3 weeks | 7,693 | 22 | 0.29 |
| 125,000 | 2–4 " | 9,946 | 27 | 0.27 |
| 375,000 * | 2–4 " | 4,026 | 17 | 0.42 |
| 500,000 | 2–3 " | 4,137 | 21 | 0.51 |
| 500,000 | 10 days | 2,113 | 8 | 0.38 |
| 125,000 † | 4 weeks | 11,700 (approximately) | 39 | 0.30 |
| Total | | 39,615 | 134 | 0.34 |
| Placebo | 2–4 weeks | 1,762 | 3 | 0.17 |
| Placebo † | 2 " | 4,000 (approximately) | 2 | 0.05 |
| Total | | 5,762 | 5 | 0.09 |

* 125,000 u. 3 × daily for 10 days, then 125,000 u. daily.
† Gezon, et al.[2]

## Discussion

Experiments in mass prophylaxis with oral penicillin in military populations have been made by three other groups of investigators;[2, 6, 7] Gezon, et al.,[2] compared once daily doses of 125,000 units of penicillin with 0.5 gm. of sulfadiazine. Both were effective in reducing the incidence of streptococcal infection. Sulfadiazine failed to reduce the frequency of recovery of streptococci from the throats of well recruits, whereas penicillin caused a considerable reduction. Wannamaker, et al.,[6] also reported on the efficacy of various doses and preparations of penicillin in eliminating streptococci from carriers. Pertinent to the present report was the observation that a dose of 250,000 units once daily for 10 days was not highly effective. Doses of 500,000 units or 1,000,000 units twice daily did not appear to be more effective than was the 250,000 units twice a day regimen in Navy recruits. Large doses given for only five days were relatively ineffective in comparison with the results of the same dose continued for 10 days. A controlled experiment in mass prophylaxis with 2,000,000 units of oral penicillin daily for either five or 10 days was conducted. While abrupt reduction of the incidence of streptococcal infection occurred, the effect persisted only a short time after prophylaxis, probably because of the intimate contact between groups which had received prophylaxis and those who had not.

The studies of Bernstein, et al.,[7] in Air Force recruits are most comparable to studies made in Navy recruits with a dose of 250,000 units twice daily. Both five- and 10-day regimens were tried. Results showed the 10-day regimen to be the most effective and closely paralleled the results obtained with 14- and 21-day regimens in Navy recruits. The type 3 streptococcus responsible for the epidemic in Air Force recruits persisted through a 10-day period of prophylaxis in all recruits, as did the type 19 streptococcus in Navy recruits during 1954. On the theory that recurrence of an epidemic might stem from incoming recruits, prophylaxis was continued in about half of newly arrived men. Results were inconclusive, but the authors expressed an opinion that epidemic recurrence more probably stemmed from uneradicated sources on the post than from new recruits.

Once virulent strains have been introduced, rapid spread occurs from old recruits to new recruits. During epidemics a high percentage of recruits completing training are carriers and may spread the epidemic into other populations to which they are assigned. In the Navy a majority of the population in service schools (secondary training) is derived directly from the several recruit training centers. If epidemic streptococcal infections are occurring at any one of the recruit centers, a direct pathway of spread into the several service schools exists. Since these schools are located on posts where recruit training is also done, epidemics originating in recruits on one post may reach recruits at another post via the transfer of large numbers of men into the service schools.

These comments regarding potential sources and pathways of spread of epidemic streptococcal infections have been made because an understanding of the epidemiology is essential to the intelligent use of penicillin prophylaxis. Potentially, if a population involved by an epidemic could be closed to all outside sources of virulent streptococci and the organisms eliminated from all carriers within the population, an epidemic could be permanently terminated. Practically, it is doubtful that this objective is attainable in most military populations. The potential pathways by which virulent strains may be introduced seem too numerous to be blocked completely. Furthermore, it is doubtful that any dose of a preparation of penicillin that is prac-

tical for use in prophylaxis will eradicate streptococci from all carriers in a population.

Since epidemics can quickly be brought under control with a relatively short course of oral penicillin and the effects can be expected to persist to some degree after prophylaxis is stopped, it would seem more practical that a diligent search be maintained for first evidences of the beginning of epidemics and that control be maintained by intermittent courses. This is particularly true, since it appears that it may not be necessary to prevent all streptococcal infections to maintain a continued suppression of rheumatic fever. Under circumstances where epidemics rapidly recur it may prove practical to maintain suppression by continuous administration of 50,000 units of oral penicillin once daily.

In general, however, continuous prophylaxis with small doses is undesirable unless administration can be strictly supervised by responsible individuals. In these studies both supervisors and recipients were reluctant to adhere to the program after the epidemic was ended. There is also a greater risk of causing emergence of a penicillin-resistant strain of group A streptococcus, if such exists. Men known to have had previous attacks of rheumatic fever should probably receive continuous prophylaxis throughout their stay in training camps or schools. For this, a long acting, parenteral penicillin preparation [8] is probably preferable to oral penicillin.

When men known to have had previous sensitivity reactions to penicillin are exempted, the risk of mass prophylaxis with oral penicillin is negligible. Fewer serum sickness type or severe reactions have been experienced by Navy recruits than occurred in Air Force recruits [7] with the same dosage of penicillin. While there seems to be some slight correlation of reaction to dosage, one of the most severe reactions experienced by Navy recruits followed 50,000 units once daily. An occasional severe reaction will probably have to be anticipated, but the risk appears to be minimal in comparison with the risk of individuals developing serious complications or sequelae if epidemics of streptococcal infections are allowed to go uncontrolled.

There seems little possibility that penicillin-resistant strains of streptococci will emerge if mass penicillin prophylaxis is continued. Despite the widespread civilian usage of this antibiotic over a period of years and the fact that the more common therapeutic regimens are too short to eradicate the streptococcus from most human carriers, there has been no evidence of increasing resistance of streptococci to the antibiotic, such as has been observed with staphylococci and other organisms. Uniform sensitivity of group A streptococci to penicillin has been found in the thousands of strains tested during these studies, whereas Gezon [2] found at least one and probably two sulfonamide-resistant strains among 1,618 strains studied.

## Summary and Conclusions

Epidemics of streptococcal infection in military populations can be prevented by continuous administration of oral penicillin in a dosage as small as 50,000 units per day. They can be abruptly terminated by 250,000 units of oral penicillin twice daily. If continued for 10 or more days, this dose will eliminate the streptococcus from the throats of a majority of carriers.

Suppression or termination of epidemics of streptococcal infections with penicillin is attended by a reduction or termination of rheumatic fever and other complications. Intermittent 10-day courses of 500,000 units of oral penicillin daily, if spaced at short intervals, will probably almost completely prevent rheumatic fever even though limited recurrences of epidemic streptococcal infections occur between courses.

The risk of untoward reactions to oral penicillin is minimal and less than is the risk attending uncontrolled streptococcal infections in a susceptible population.

Penicillin-resistant strains of group A streptococci have not been demonstrated during these studies, nor has there been evidence of increasing resistance of group A streptococci following mass penicillin prophylaxis.

The results of these studies should be applicable to civilian populations and provide a means for the control of epidemic streptococcal infections in children's institutions and schools.

Penicillin prophylaxis is not considered a desirable or final answer to the problem of control of epidemic streptococcal infections. Rather it is an interim measure, the judicious use of which will allow the emergency control of demonstrated epidemics of streptococcal infections and which is economically and administratively feasible.

A knowledge of the epidemiology of streptococcal infections in the population for which prophylaxis is considered is essential for its intelligent use.

ACKNOWLEDGMENT—Significant contributions to these studies have been made by the following personnel of Naval Medical Research Unit No. 4: Lieutenants R. W. Weber (MC), USNR; T. B. Gibbons (MC), USNR; S. R. Ziegra (MC), USNR; G. J. Friou (MC), USNR; W. J. Mogabgab (MC), USNR; J. E. Banta (MC), USN; C. E. Curtis (MSC), USN; Paul F. Frank, bacteriologist; and York E. Crawford, immunologist. Many others have also contributed and these contributions are gratefully acknowledged.

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# Clinical Research Activities of the National Institute of Dental Research

RALPH S. LLOYD, D.D.S.

*In very brief space is listed a number of researches of great variety and depth—an account which lends encouragement and inspiration to all who are concerned in any way with the betterment of oral health.*

The Clinical Center of the National Institutes of Health provides special physical facilities and opportunities to combine clinical and laboratory research, and serves as a central clinical facility for the seven institutes of the National Institutes of Health.* The 500-bed patient care area of the Clinical Center is comparable in staff and equipment to a good teaching hospital with special provisions for the comfort and welfare of chronic disease patients. The research workers in the various institutes devise special clinical projects which are performed under the most rigid standards demanded of good research. The patients who are accepted for treatment and investigation are referred by private medical and dental practitioners or by various institutions. The patients must have a previous diagnosis of the disease or other condition which is required for a particular investigation.

The dental department of the Clinical Center offers facilities for treatment and for investigation of dental diseases. Thus, the dental department has two obligations to perform. One is to make a complete dental examination and to recommend treatment if needed for all individuals who are admitted to the Clinical Center as patients. The other obligation is to provide the staff of the National Institute of Dental Research with facilities for clinical investigation. In addition, personnel are provided to cooperate in its various endeavors. For example, we are able to perform the necessary operative dentistry for patients under study in the field of growth and development or in periodontal research.

An adequate dental examination is an essential part of any patient's clinical record, but in clinical research such a dental examination is doubly important. As a routine procedure each patient has full mouth radiographs and a salivary sample taken. The National Institute of Dental Research also has laboratory facilities for clinical research within the Clinical Center. These laboratories are available to those investigators who are interested in problems closely akin to those of the clinicians. Soon the institute will have a few patient beds to be used in connection with its clinical investigations.

In the first year of operation, after the initial problems of space, equipment, personnel, and organization were solved, we were able to begin several productive

* In addition to the National Institute of Dental Research, these are the National Cancer Institute, National Heart Institute, National Institute of Mental Health, National Microbiological Institute, National Institute of Arthritis and Metabolic Diseases, and the National Institute of Neurological Diseases and Blindness.

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This paper was presented before the Dental Health Section of the American Public Health Association at the Eighty-Second Annual Meeting in Buffalo, N. Y., October 15, 1954.

laboratory, field, and clinical studies of dental problems. One of these was an epidemiologic survey of the physiological effects of fluorides in the drinking water of two population groups. A related study concerns investigating possible histological or chemical changes in individuals who lived in high fluoride areas. Another project is one in which a carefully conducted balance study measures the fluoride turnover in the presence of cardiovascular or renal diseases as compared with that in normal controls.

Among our particular interests are those problems that demand combined medical and dental attention for their solution. In this category are such conditions as chronic stomatitis, gingivitis, infection and wound healing, and leukoplakia. We are fortunate to have as a member of the National Institute of Dental Research a physician who is interested in medical problems relating to oral disease. The opportunity is thus provided for complete evaluation of the systemic condition of the patient.

In the field of oral surgery a clinical study of cysts of the mandible and maxilla is planned. The study will attempt to shed light on such problems as etiology, specificity of area, why only a small percentage of residual granulomas develop into cysts, and the percentage of cysts that are foci of infection. Data are to be accumulated on general anesthesia used in oral surgery. These data may aid in the evaluation of new, rapidly acting drugs, administered intravenously, which are constantly being introduced to the profession.

In the field of growth and development an investigation into more simplified ways of treatment of specific types of malocclusion is under way. The use of the guide plane and bite plane in Class II, Division I malocclusion, is being studied. Other projects in this field include a continuation of researches instituted elsewhere. These comprise studies on growth and development of the head in young children with cleft lip and cleft palate, and of children with other congenital and acquired anomalies such as progeria, craniostenosis, Treacher-Collins' syndrome, and disturbances of the temperomandibular joint. Another study to be continued is an analysis of the patterns of electrical activity of the muscles of mastication in normal and pathologic conditions by means of electromyography.

One investigator plans to study the efficiency of orthodontic expansion on postoperative cleft lip and palate cases and to compare the effects of such expansion with orthodontically expanded noncleft cases. In addition, he expects to study the functional positions of the condyle in the mandibular fossa. He also plans to explore by cephalometry the best position of the pharyngeal section on a cleft palate speech appliance. Experimentation involving the construction of appliances for cases requiring maxillofacial prosthesis is planned.

Several studies of periodontal disease have been started. One is a comparison of the conservative versus the more radical treatment involving surgery. In this study and in other clinical investigations we may discover certain diagnostic criteria which may help to forecast the result of treatment. The effect of occlusion on the periodortium, particularly premature contacts, is being investigated. A study of the effects of treatment on artificially created gingival pockets is also proposed.

In the field of oral pathology an investigator has established, on the basis of autopsy material, that there is a progressive cyclic phenomenon of periodontal tissue destruction in relation to calculous deposits. He now wants to know how this information is related to clinically active cases of periodontitis simplex. He also plans to evaluate the effect of the process upon the epithelial attachment.

An accurate periodontal score indi-

cating the severity of periodontal disease was proved of value in field studies and was given a clinical trial. The clinician's judgment upon direct examination compared well with x-ray findings. It was also found that an accurate periodontal score could be assigned by a cursory glance. Subsequently a study was undertaken of the systemic condition of persons with periodontal disease. Each patient examined is assigned a periodontal score which corresponds with the gravity of periodontal disease within his mouth. His clinical record is then searched for conditions that may be correlated with the periodontal finding. This approach offers particular promise here because of the unusually complete and detailed series of diagnostic and other tests carried out for each patient.

Since the Clinical Center is a new venture and is just getting under way, the previously mentioned projects are only the beginning of clinical investigations of the National Institute of Dental Research. Other studies have been suggested. Among them are: the effects of radiation on oral health and oral infection; reattachment of tooth supporting tissues; effects of steroids, hormones, and related substances upon oral lesions; tissue tolerance to prosthetic appliances; trigeminal neuralgia; methods of determining the center of rotation of the mandible and determination of a definite working and rest bite in prosthetics.

We would be grateful to you in the field of dental public health for your assistance in obtaining case references and in helping us maintain good relations with the dental profession. There are certain types of cases which you in public health more than anyone else may assist us in obtaining. For example, patients afflicted with cleft palate and other types of cases as previously mentioned.

It would be a privilege to have you and your co-workers in the field of dental public health visit us at the National Institute of Dental Research. We shall be very glad to show you our new clinical facilities and will welcome discussion and your suggestions for improving our clinical research program.

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"Of the good leaders the people only know that they exist; the next best they love and praise . . . ; but of the best when their task is accomplished . . . the people all remark, 'we have done it ourselves.' "—Lao-Tse

American Journal of

# PUBLIC HEALTH

and the Nation's Health

Official Monthly Publication of the American Public Health Association, Inc.

Volume 45 | May, 1955 | Number 5

## The Salk Poliomyelitis Vaccine

Thousands of the public health professions were represented among those who heard and saw the dramatic announcement made at the University of Michigan on April 12th with the report of Dr. Thomas Francis, Jr., and his associates from the Poliomyelitis Vaccine Evaluation Center on the 1954 field trials of the vaccine prepared by Dr. Jonas Salk. The American Journal of Public Health is gratified to be able to include with this May issue a Supplement reproducing the complete report. The cooperation of Dr. Francis and of the National Foundation for Infantile Paralysis is cordially appreciated. The report speaks for itself and tells a most encouraging story. The 1954 vaccine was notably harmless and the benefit undoubtedly significant, especially against the paralytic form of the disease.

This announcement was so presented as to arouse and sustain an unprecedented public interest. It is to be expected that the public backing for scientific research will be encouraged and strengthened.

The report reflected the integrity of its authors so well that its conclusions are assured a high degree of acceptability among all those in public health. Now that it has been released for use by the National Institutes of Health, our professions can be counted on to do their utmost to get the full value from the vaccine before the coming poliomyelitis season.

## Health Supervision of Young Children: A Milestone

The issuance of significant, authoritative guides on standards in public health work has been a traditional responsibility of the American Public Health Association. A new milestone is marked by the recent publication of the Association's Committee on Child Health, "Health Supervision of Young Children: A Guide for Practicing Physicians and Child Health Conference Personnel."

The present-day concepts on health supervision of well children have been placed between the covers of one book. Since "milk stations" were started more than fifty years ago, progressive changes have taken place on the road to our current methods of preventing illness, promoting positive health, and counseling parents concerning the rearing of their children from birth to school age. In this new volume a nice balance is attained between emphasis on the physical and nonphysical aspects. The guide gives technics in interviewing and counseling, both by the

individual and the group methods, and the roles of the doctor, nurse, and other professionals are described. The material should be useful in the private physician's office and in the child health conferences.

The general text is easy to read and valuable, compact appendexes are included on such subjects as record forms, immunization, how to know when a child health conference is needed in a community, floor plans, conference equipment, and a valuable bibliography. As a "must" on the subject of health supervision of young children, it will be useful to the administrator, consultant, and field worker for planning and developing child health conferences and for staff training and supervision.

Over a five-year period, the elaborate stages of developing the document included collection of manuals from state and local health departments and other agencies operating child health conferences, tabulation of material, review of literature, preparation and wide distribution of a first draft and successive drafts, review conferences by consultant groups, a last writing by Nina Ridenour, Ph.D., and then final clearance. Administrators, supervisors, and field workers contributed and represented the disciplines of education, psychology, pediatrics, nursing, nutrition, and social work. After careful review, official endorsement was given by the American Academy of Pediatrics, the Association of State Maternal and Child Health and Crippled Children's Directors, the Children's Bureau of the U. S. Department of Health, Education, and Welfare, and the National League for Nursing, Inc. This rigid "pretesting" helped to make the guide helpful and practical.

Credits for such a work obviously belong to many: the committee members under Dr. Samuel Wishik's chairmanship, the consultants, the review committees from the Academy of Pediatrics and other organizations, the nameless people in health departments and other agencies who read the document line by line and sent interlinear and marginal comments, Dr. Ridenour who in her own expert fashion translated essential information into painless reading, and the organizations which helped finance and publish the document—the Association for the Aid of Crippled Children, the New York Fund for Children, and the Ittleson Family Foundation.

With this start on the part of the committee, we look forward eagerly to the publication in the months ahead of the first several numbers of a series of 12 guides on programs for various types of handicapped children.

## The Present Status of Rabies Control

Since rabies was first recorded on the North American continent in the middle of the eighteenth century, it insidiously has continued to exact its toll from the public health, agricultural economy, and wildlife conservation of the United States. In spite of its apparent entrenchment in large segments of civilized populations, it is not a disease "we have learned to live with." The inevitable termination of the disease in agonizing death has made it one of the most feared maladies affecting man. Furthermore, the unpleasant and expensive series of vaccinations indicated after exposure is established, and the realization that these vaccinations are not always given without danger, have been the source of a conglomerate headache for the health officers of the country.

Examination of the epidemiology of rabies reveals that it is ubiquitous in character. Climate and season have no influence on its occurrence. It is found in

the arctic regions as well as the tropical countries of the Old and New Worlds. By the same token, it may be present during any season of the year. The disease, in nature, is characterized by a relatively long and variable incubation period. Transmission occurs by the entrance of virus-laden saliva into a wound generally caused by the bite of a rabid animal. The probability of human infection is dependent upon the concentration of the virus in the saliva of the biting animal, the site of the bite on the body (bites on the head, neck, and face are most dangerous; the hands, feet, arms, and legs are next in importance, and on the trunk least dangerous), the depth of the bite, the multiplicity of the bite, and the possible interposition of clothing. The rabies virus is an extremely labile organism and loses its virulence rapidly when exposed to light, heat, and drying. Thus, fomites or indirect exposure by contaminated objects are of no real significance because the virus is destroyed so easily in the atmosphere.

Over the years, one of the very real problems in the specific biological therapy of exposed persons was the ineffectiveness of vaccine in severe bite cases, especially in those involving the region of the head when the incubation period was too short to allow for the development of immunospecific protection. This problem has now largely been overcome by the production of hyperimmune rabies antiserum which can be administered to confer sufficient passive immunity in that critical early period of time before the vaccine can stimulate active protection. Convincing experimental evidence in challenge tested laboratory animals and in antibody studies in man has established its value when followed by the usual course of vaccine. One serum injection with 0.5 ml./kg. of body weight is given within 72 hours of the bite or sooner. As with all serum therapy, the usual precautions should be taken to test for sensitivity of the patient.

In another phase of the problem, our attention has been drawn in recent years to the number of postvaccinal complications following administration of the prescribed series of rabies vaccine treatments in exposed persons. These reactions are believed to be tissue-specific isoallergic phenomena which apparently are not related to the rabies antigen present, but rather to some encephalitogenic component of the nerve tissue in the vaccine. Research experiments are proceeding at this time in search of new approaches which will lead to an effective vaccination regime without the danger of CNS damage. In the meantime the promiscuous administration of antirabic inoculations should be discouraged by exercising sound judgment in weighing each dog bite case on its individual merits. The WHO Expert Committee on Rabies in its latest report has prepared a valuable chart dealing with indications for vaccine treatment. This chart contains an exhaustive series of treatment schedules which vary in intensity in accordance with the nature of the exposure and the clinical condition of the biting animal. In this connection, it is of paramount importance to capture and impound the biting animal for clinical observation whenever possible.

There can be no question that the ultimate solution to the rabies problem is predicated on the control and eventual elimination of the disease from animal populations. This may be accomplished by the setting up of transmission barriers, such as animal immunization, elimination of stray dogs, and the reduction of excessive numbers of wildlife vectors. Extensive laboratory research and field projects have proved that these technics may be applied successfully to eradicate the disease from a given area if integrated into a carefully planned and well executed program. Dramatic demonstrations of the effectiveness of such programs have been displayed in recent years in many parts of the United States. It remains for us now to muster

the forces of the rest of the country to set similar machinery in motion for an all-out fight against rabies.

It is an established premise that coordination of control activities is the keynote of a successful state-wide rabies control program. For this reason it is advisable that the complete administration of such a program be delegated to a qualified public health veterinarian at state level. The development of such a program under the health department veterinarian can insure effective uniformity of control practices among the various health jurisdictions.

Local rabies control works best on a county-wide basis and sound programs should include the following basic activities: (1) Mass immunization of dogs. This should be carried out intensively on a schedule that aims at the vaccination of all owned dogs within the shortest possible time. In the face of a serious outbreak, at least 70 per cent of the entire dog population of the county should be vaccinated within a two- to three-week period. (2) Elimination of all stray dogs. Mass immunization will not reach the stray or ownerless dog, which remains as a potential threat in transmission of rabies. An efficiently conducted program requires the operation of a local pound or humane shelter where stray animals may be kept for a few days and, if unclaimed at the end of that period, destroyed humanely. Collection of strays should be carried out by teams of dog wardens and assistants in properly equipped trucks. Licensing or registration of all dogs often is a valuable adjunct. If properly enforced, it identifies the ownerless strays, helps to defray the expense of control activities, and may serve as the basis of a reasonably accurate dog census. (3) Reduction of excess numbers of wildlife vectors. Outbreaks of rabies in wild animals, such as foxes and skunks, occur generally when the population of the species becomes particularly dense in an area. Organized countywide trapping programs are the most effective means of reducing this overpopulation to a safe level in areas menaced by wildlife rabies.

Other important measures are restraint of dogs while the control campaign is under way and pursuit of a continual and energetic publicity campaign. Essential to the success of the program is good organization under health department and veterinary medical auspices with the fullest use of all technical resources in the community.

Perhaps the most significant advance in the field of rabies control in recent years has been the development of a modified living virus vaccine (Flury strain) produced in chicken embryos. Comparative duration of immunity experiments in dogs at the Communicable Disease Center have shown that this vaccine is significantly superior to the older type inactivated virus nerve tissue vaccines for periods of at least three and one-fourth years between vaccination and experimental exposure. Field experience with this vaccine has thus far corroborated the results of the controlled tests. The WHO Expert Committee on Rabies in its recent report "recognizes that the chicken-embryo vaccine (Flury strain) produces excellent immunity in dogs for at least three years following a single intramuscular injection (posterior thigh muscles) and recommends the use of this vaccine in mass immunization programs." Further studies at CDC have shown that pups can be immunized successfully as early as three months of age, although most of these animals were challenged after relatively short postvaccination periods. For this reason, it is recommended that dogs vaccinated under six months of age should be revaccinated within the first year of life. Thus, in areas which have successfully eliminated the disease, but are faced with the constant danger of its reintroduction, we can vizualize a prophylactic regime somewhat similar to smallpox vaccination in

human populations by vaccinating dogs with chicken embryo (Flury strain) vaccine at three months and one year of age, followed by a booster vaccination three to four years later. It should be emphasized, however, that this procedure by no means precludes the necessity of carrying out intensified mass canine immunization campaigns in areas of enzootic or epizootic rabies.

(The Journal is indebted to Ernest S. Tierkel, V.M.D., assistant chief, Veterinary Public Health Services, Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Atlanta, Ga., for assistance in the preparation of this editorial.)

## Physician Heal Thyself—And a Grim Reminder

The smallpox epidemic in France this year and the appearance of several cases later in Belgium are startling enough in themselves. No one likes to assume that a preventable disease can appear to such an extent in a Western country in 1955. The experience reminds us once more that the ghosts of these preventable diseases have been laid in the literature and not in fact.

An additional lesson of sadness appears in the incident in the death of a medical public health director who treated the first patient in one of the areas before he himself had been vaccinated. He died in the latter part of January.

It is unfortunate that the doctor and sometimes his family are too often the last individuals to practice the ounce of prevention which the medical officer continually preaches.

In mid-January of this year a small outbreak of smallpox was reported in the City of Vannes, on the coast of Brittany in northwest France. By the end of January the outbreak had assumed serious proportions in Vannes with 67 cases and 15 deaths. It had also spread to the cities of Rennes, Nantes, Lorient, and Brest. Over one million persons have already been vaccinated. Further spread will undoubtedly occur before the epidemic is completely controlled.

In the meantime several cases have been reported in Belgium and all forces have been alerted to bar passage of smallpox from country to country. The infection has been traced to a French soldier, returned from the French-Indochina war.

The U. S. Public Health Service has tightened its rules for sea and air travelers and the regulations for movement are being rigidly enforced.

All U. S. Air Force personnel located in France has been reimmunized, since two cases have been reported in February in northeast France, in the vicinity of Air Force bases.

The regulations agreed upon recently by the Army, Navy, and Air Force for military personnel, their dependents, and civilians traveling under the Armed Forces require that they must have been successfully vaccinated against smallpox subsequent to January 1, 1955, for travel to, through, or from France.

The recurrence of this pernicious disease in a well regulated country is new proof that public health vigilance must be more than a good phrase.

A COMMITTEE REPORT

# Chemicals Introduced in Foods

## Food and Nutrition Section

The Committee on Chemicals Introduced in Foods was established by the Food and Nutrition Section in 1948. In that year, and again in 1953, a symposium was arranged on this subject and presented at the Annual Meeting of the APHA. All of the papers presented at the 1953 session have been published in condensed form in the August, 1954, issue of the American Journal of Public Health. Reports to the Section members have been made each year and in this, the report for 1954, we believe it is worth while to summarize in the briefest manner the developments since the committee was established a little more than six years ago.

This committee early recommended that legislation be developed to require an orderly consideration by scientific experts and approval before use of chemical additives to foods. This recommendation was approved by the Section, and by vote of the Governing Council it became the official position of the American Public Health Association. That attitude now appears to be widely appreciated. Important segments of the food industry have stated as their considered opinion that the federal law should be modified to provide adequate authority for the Food and Drug Administration to control the addition of unusual substances to nonstandardized foods. The food and chemical businesses in large measure have come to view as a necessary business expense the cost of adequate testing of newly proposed ingredients of foods. Increased attention to experimental studies on the health aspects of chemicals is being given by manufacturers on their own initiative.

In 1950 the Food and Nutrition Board of the National Research Council established its Committee on Food Protection. In 1950–1952 a Select Committee of the U. S. House of Representatives studied and reported to the Congress its findings and recommendations on the subject of chemicals in foods.

In all of these activities members of this committee have been active. The committee's objective, which is to maintain the integrity of our food supply—its wholesomeness, adequacy, and economy—by orderly and scientific evaluation of additives, has come to be generally accepted.

During the past year the Congress has given some consideration to several bills on the general subject of food additives. One bill which deals with pesticidal residues on raw agricultural commodities has been enacted into law. This law, Public Law No. 518 of the 83rd Congress, became part of the Federal Food, Drug, and Cosmetic Act on July 22, 1954, although not all of its provisions will become effective until one year later. Its provisions were designed to simplify and to facilitate the control of pesticidal chemical additives; these are defined as economic poisons used in the production, storage, or transportation of raw agricultural commodities. It places in the U. S. Department of Agriculture the con-

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Report of the chairman of the Committee on Chemicals Introduced in Foods.

Organized in 1948. Published reports: Year Books, 1949–1950; 1950–1951; 1951–1952.

sideration of questions of usefulness of new pesticides and in the Department of Health, Education, and Welfare, the consideration of questions of the possible public health significance of pesticidal residues in or on foods.

Proponents of the use of new pesticides are required to present scientific evidence on the basis of which tolerances may be established. Provision is made for calling upon the National Academy of Sciences to establish an advisory committee of experts to report and make recommendations. In establishing tolerances the Secretary of Health, Education, and Welfare is specifically charged to give appropriate consideration to "the necessity for the production of an adequate, wholesome, and economical food supply." This new chapter of the law contains many features of wide influence, and it will be of interest to observe how they operate in the control of this phase of the problem of food additives.

There still remain for congressional consideration measures that will provide more adequate control of substances which are purposely incorporated into foods. There is probably no need to state that no manufacturer would want to add to foods any substance, however useful, which is known to be harmful or deleterious. There may be, however, differences of opinion about the interpretation of scientific data, or there may be insufficient data available to permit the drawing of a valid conclusion. These are practical matters. They point up the necessity for the establishment of a more orderly procedure than now exists for the consideration of the health aspects of new additives; as matters stand, the cautious food manufacturer may be at a sales disadvantage.

The importance of the Food and Drug Administration to have an adequate staff of trained personnel with facilities that are necessary for efficient work is a topic that perhaps is outside the scope of this committee. It may well be mentioned, however, in view of the action by the Congress to give more responsibilities to the Food and Drug Administration, while at the same time the annual budget of this agency is cut below the figure recommended by the Bureau of the Budget. This has happened for two successive years.

The committee believes that the Committee on Chemicals Introduced in Foods should be continued and so recommends. There continues to be a need for an established body within the structure of the American Public Health Association for the consideration of the public health aspects of this field in which important questions still remain to be resolved. Some changes in the committee are no doubt desirable and are being recommended in a separate memorandum to the officers of the Food and Nutrition Section.

In closing this report the chairman wishes to acknowledge the help of each committee member, as well as the encouragement and assistance of all officers of the Section, past and present, and of the Association, in carrying out the tasks which were assigned six years ago.

FRANKLIN C. BING, PH.D.
30 West Washington St.,
Chicago 2, Ill., Chairman

# Clearing House on Public Health Salary Information and Personnel Needs

### A Recruitment Piece that "Pulls"

"The Job I Really Wanted," published by the Catholic Hospital Association, "pulls a real punch" for recruitment. A brief pamphlet has an impish teen-ager on the cover who is very satisfied with himself. Hospital jobs are presented within the framework of personal experience. The varied talents of a number of individuals are analyzed—the girl who likes to plan menus, the boy who likes science, the girl who has a talent for handicrafts, the one who is torn between becoming a nurse or being a teacher, the lad who, though not a good athlete, haunts the football field, rubs down the players, and gives heat treatment. Then these skills and ambitions are related to the jobs, dietitian, laboratory technician, occupational therapy, nurse teaching in a nursing school, and physical therapy. Numerous other occupations are described briefly.

The leaflet includes a list of 17 national associations that are sources of further information. Also listed are 72 job titles in seven groupings. Catholic Hospital Association, 1438 S. Grand Ave., St. Louis 4, Mo.; 5 cents, discounts for quantity orders.

### Institute of Acarology, Maryland

The University of Maryland announces three courses at the Institute of Acarology for the summer session, June 27–July 1, 1955. These "provide a unique opportunity for entomologists, parasitologists, zoologists, and advanced students in the field of biology to study the mites and ticks." In line with the recent important discoveries of the role of the Acarina in the fields of public health and agriculture, the program now has been expanded to be of greater service by increasing the facilities and the staff and by the participation of investigators from nearby institutions. The staff this year consists of Edward W. Baker, U. S. Department of Agriculture; Joseph H. Camin, Chicago Academy of Sciences; and George Anastos and G. W. Wharton of the University of Maryland. Further information from Mr. Anastos, Department of Zoology, University of Maryland, College Park, Md.

### Course in Ecology of Fresh Waters

The summer sessions of the University of Pittsburgh will offer, June 13–July 1, a course in the ecology of fresh waters in relation to human use. This course is designed for sanitary engineers, chemists, biologists, and others interested in this natural resource. The course will be given at the Pymatuning Laboratory of Field Biology at Linesville, Pa. Inquiries should be addressed to M. A. Shapiro, Graduate School of Public Health, University of Pittsburgh, Pittsburgh 13, Pa.

### Community Nutrition Institute

The Ninth Community Nutrition Institute convenes June 20–July 2 on the Syracuse University campus. The program is under the joint direction of the College of Home Economics of the university and the New York State Department of Health. The institute presents a public health approach to nutrition problems for nutritionists, physicians, nurses, dentists, dietitians, health educators, and others. Coronary heart disease and hypertension will be the main discussion topics. Codirectors of the institute are Anne Bourquin, Ph.D., chairman of

the University's Department of Food and Nutrition, and John H. Browe, M.D., director, Bureau of Nutrition, Division of Medical Services.

Three hours of graduate credit may be earned, but graduate credit is not necessary for participation. Approximate total cost for the two-week institute is $125. Further information from Dr. Bourquin, College of Home Economics, Syracuse University, Syracuse, N. Y.

### Medical Record Librarian Manpower

The sixth section "Health Manpower Source Book on Medical Record Librarians" has been issued by the Public Health Service. Here is an analysis of the job of the medical record librarian, education and other qualifications, registration and certification, number employed, and salaries. Authors of the 44-page volume are Maryland Y. Pennell, Marion E. Altenderfer, and Olive G. Johnson.

Two further sections of the Health Manpower Source Book are now in preparation. They will describe the situation with respect to dentists and dental hygienists.

Public Health Service Publication No. 263, Section 6, Gov. Ptg. Office, Washington 25, D. C.; 30 cents.

### Pioneer in Health Education

"Mabel Caroline Bragg—Pioneer in Health Education" is one of the brief biographies appearing in "Health Bulletin for Teachers." The facts of Miss Bragg's professional life are so interesting and so imaginatively recreated that the result is not only a biography but a recruitment tool.

This leaflet, together with several earlier Metropolitan Life Insurance Company publications, are valuable helps in health education recruitment. In 1953 Health Education as a Career and Health Education were produced, respectively, as a "Health Bulletin for Teen Agers" and "Health Bulletin for Parents." About the same time "Using Advances in Medical Science Through Health Education" appeared in "Health Bulletin for Teachers" (November, 1953). This is, in effect, an introduction to health education designed to interest the young person in the field as a career. Each of these is available from the Metropolitan Life Insurance Company, Health and Welfare, One Madison Ave., New York 10, N. Y.

### Employment in the Social Sciences

Two recent Bureau of Labor Statistics bulletins have relevance for public health workers. "Personnel Resources in the Social Sciences and Humanities," Bulletin 1169, and "Employment Outlook in the Social Sciences," Bulletin 1167, indicate that professional employment in these fields is most likely to be as teachers or in government service. Among nine groups in these fields, the highest median salaries were reported for statisticians and economists. These were also the only two groups employed in significant numbers in industry. It was further found that college and university salaries were lower than those in either private industry or government. As a whole also women were less well paid than men, the average differential for the same age, education, and work being about $1000 annually. Regional Offices of the Bureau of Labor Statistics or Superintendent of Documents, Washington 25, D. C., Bulletin No. 1169, 70 cents; Bulletin No. 1167, 30 cents.

### Integrated Rehabilitation Program

The Team Concept in an Integrated Rehabilitation Program is the title of a coming field workshop for professional rehabilitation personnel. To be given at the Institute for the Crippled and Disabled, May 30–June 24, the workshop is

sponsored by the U. S. Office of Vocational Rehabilitation. Limited to 25 members, preference is given to applicants sponsored by recognized agencies. The whole gamut of rehabilitation workers from physiatrists to group workers are eligible.

The workshop fee is $100 without living costs. A limited number of $200 stipends is available for those whose attendance is a financial hardship.

Apply to Willis C. Gorthy, Director, Institute for the Crippled and Disabled, 400 First Ave., New York 10, N. Y.

### Course in Testing Hearing

Northwestern University offers an intensive six-week course in the testing of hearing, June 20–July 30. It is intended for public school nurses, industrial nurses, office audiometrists, and others who give hearing tests and "registration is limited" to mature persons with demonstrated interest in the field of hearing. Further information as to courses, tuition, and application forms from Raymond Carhart, Professor of Audiology, Northwestern University, Evanston, Ill.

### Michigan's Recruitment Piece

The University of Michigan uses one issue of its bi-weekly official publication as a recruitment tool aimed toward high school seniors. The health sciences that are discussed are public health, sanitary science, health administration, medicine, dentistry, pharmacy, nursing, technology, dental hygiene, physical therapy, and others, including dietetics and anesthesiology.

There is a brief description of each, an illustrative photograph, and a chart showing the preprofessional and professional course and practice requirements.

The School of Public Health now is one of 17 universities giving baccalaureate degrees in sanitary science. It also offers a baccalaureate degree in health administration for "administrative associates" whose work is in administration or supervision of public health activities, not in medical or scientific activities. The four-year curriculum requires two years in the College of Literature, Science and Arts, two years in the School of Public Health, and a summer session in supervised field work.

### Careers in Mental Health

The National Institute of Mental Health has revised its series of four mental health careers pamphlets. Their over-all title is "Careers in Mental Health" and the separate titles:

As a Psychiatrist
As a Psychiatric Social Worker
As a Psychiatric Nurse
As a Clinical Psychologist

They carry Public Health Service publication numbers, 25, 26, 27, and 28, respectively. The entire series also appears in a single pamphlet, publication No. 23. Each of the pamphlets is 10 cents. Gov. Ptg. Office, Washington 25, D. C.

# Credit Lines

The Journal cannot furnish copies of items mentioned in Credit Lines. Please send requests to the addresses given.

### Laboratory Services for the Doctor

"Physicians' Guidebook to Public Health Laboratory Services" of the Connecticut State Health Department is in its second edition. Its purpose is to furnish to every physician in the state "ready-reference" information about the diagnostic services that are available at the department's Bureau of Laboratories (Hartford, Conn.).

The guidebook is based on the seventh edition of "Control of Communicable Diseases in Man" of the American Public Health Association. For the diseases included in that volume and about a dozen additional ones, the guidebook gives seven items—etiology, source of infection, mode of transmission, prevalence, current laboratory services, collection of specimens, and limitations of laboratory tests. Material for the first four is taken verbatim from the "Control of Communicable Diseases in Man."

### The Best Method for Visual Screening

Visual impairments are the commonest physical defect (next to dental caries) that occur in school children. The problem of what is the best and most reliable method of visual screening has baffled many a public health and public school official through the years. Each of several methods has had enthusiastic adherents, but there have been few, if any, well controlled and fully documented objective studies. Now, at last, an outstanding comprehensive and detailed study is available which is a milestone in this field.

The study entitled "Screening School Children for Physical Defects" was carried out jointly by the National Society for the Prevention of Blindness, U. S. Children's Bureau, Missouri State Division of Health, the Department of Ophthalmology of Washington University School of Medicine, and the Office of Naval Research. It reports the details of an unusually comprehensive evaluation of seven different types of vision screening procedures in comparison with a complete clinical examination by an ophthalmologist. Each of these procedures, including such familiar ones as teacher judgment, Snellen tests, Massachusetts vision tests, as well as some elaborate varieties, were done on more than 1,200 St. Louis school children in the first and sixth grades.

The results have been analyzed in detail by Marian M. Crane, M.D., Franklin M. Foote, M.D., Richard G. Scobee, Ph.D., and Earl L. Green, Ph.D., with the statistical assistance of Bronson Price. It sheds new light on such questions as which procedure is the most reliable; which gives the most overreferrals; does economic status affect visual defects?, etc. U. S. Gov. Ptg. Office, Washington 25, D. C.; 35 cents.

### "Viewpoint" Begins Publication

"Viewpoint" first appeared in January, 1955, as the winter issue of what it is reported will appear only when the "publisher . . . feels there is something sufficiently useful to say." Its publisher is the New York State Charities Aid Association. The general plan is to carry

one or two articles in each issue about health and welfare developments of major significance.

This first issue should be of particular interest to the public health world for it is "entirely devoted to the momentous new program of state aid for the expansion of local resources in mental health." Other states will want to know about this program. Harry S. Mustard, M.D., is executive director of the State Charities Aid Association, 105 E. 22nd St., New York 10, N. Y.

### Accidents, Crime, Sanitation

The Center for Mass Communication of Columbia University announces several new films or radio transcriptions of interest to public health workers. They are:

Fly about the House—an animated cartoon by Halas and Batchellor on home sanitation—10 minutes, rental $4 per day, purchase $90.

Little Songs for Living—13 tunes on avoiding accidents in the home and on the highway—record album of four sides, 10-inch, $2.90.

Why Did He Do It?—Six transcribed radio documents of crime case histories. Prepared under the supervision of mental health leaders. Narrator, George Hicks. For nonbroadcast use in PTA meetings, discussion groups, classes, libraries, etc. $15 set. For broadcast use sliding scale of prices.

### Dramatizing an Official Report

"Golden Years in the 'Silver City' " is an eight-page pamphlet in which are summarized some of the highlights from the Report of the Connecticut Commission on the Potentials of the Aging. With a few facts, a few pictures, a few charts, and imaginative make up, a great deal of information and suggestion are conveyed. What is here reported is based on a survey in Meriden, a city of about 45,000. Facts were gathered, interpreted, and recommendations made with regard to employment, health, cost of idle workers, and retirement preparation.

The illustrated pamphlet and the complete report are each available from the Department of Rural Sociology, University of Connecticut, Storrs.

### More About Housing for the Aged

Architects have their say about housing for the aged in two recent publications.

These follow close upon the design standards recently developed by the Massachusetts State Housing Board for housing the elderly in their own homes. (Discussed in A.J.P.H. 44:1202 (Sept.), 1954.)

Standards for housing older people who live in homes for the aged were developed by the Housing Research Council of Southern California. Standards for homes integrated with medical and nursing services for the infirm aged are developed in the Architectural Record for September, 1954, in collaboration with "Modern Hospital." The editors assume that "there is now a concerted effort to attack the problem on a broad front," but "if good health for all our old people is the objective, we shall need building facilities of all types."

The Architect Looks at Housing the Aged. Housing Research Council of Southern California, Inc., 204 S. Los Robles Ave., Pasadena 5; 50 cents.

Buildings for the Aged; Building Types Study No. 214. Architectural Record (Sept.), 1954. 119 W. 40th St., New York 18, N. Y.

### Refuse Disposal Methods

Refuse disposal was the topic of the tenth Local Government Conference held at the University of Pittsburgh in April, 1954, under the sponsorship of the Pennsylvania Department of Health, the Graduate School of Public Health of the University of Pittsburgh, and the Institute of Local Government. Karl M. Mason represented the Health Department, and Maurice Shapiro, the Graduate School of Public Health.

The three-day conference was con-

cerned chiefly with current disposal methods and their relative advantages and disadvantages together with a summary of changing trends and new developments. Among the latter, household grinders and composting received special attention. The technical discussions have been published by the Institute of Local Government, University of Pittsburgh, Pittsburgh 13, Pa., under the title, "Proceedings—Local Government Conference on Refuse Disposal Methods." $1.

### Health in the Workshop

The Public Health Service cooperated in the preparation of and is helping to publicize "Health Maintenance for Greater Efficiency," prepared by the Small Business Administration. The value of health maintenance services is illustrated by a number of dramatic case histories. There are suggestions as to means of providing such services, costs, and management problems. A list of sources of help and of selected references is included. Health officers, directors of industrial hygiene divisions or health educators might well be familiar with this pamphlet in their contacts with the small business concerns of their communities. Gov. Ptg. Office, Washington 25, D. C.; 25 cents—25 per cent discount in lots of 100 or more.

### Exploring Dental Health Insurance

The Group Health Association in Washington, D. C., now in its 19th year, provides about 20,000 persons with comprehensive medical care and hospitalization on a prepayment basis. A dental program was established by the association in January, 1949, on a fee-per-service cost basis for a limited number of persons electing such service. It is hoped that out of this program sufficient data and administrative experience might be acquired to make possible its ultimate conversion into a prepaid dental service.

This experience, based on 1,925 dental patients, is now reviewed in "Comprehensive Dental Care in a Group Practice," published by the Public Health Service and sponsored jointly by the Service's Division of Dental Resources and Group Health Association. That the association is not yet ready to adopt a dental health insurance plan is indicated by the statement that "the data . . . do not constitute a blueprint for the financing of dental services on an insurance basis."

Public Health Service Publication No. 395, Gov. Ptg. Office, Washington 25, D. C.; 25 cents.

### Citizens, Television, and Education

The National Citizens Committee for Educational Television (Ring Building, Washington 6, D. C.) was organized in late 1952 to develop broad-based citizen support for educational television. Previously, a group representing mainly college TV stations and a special committee of the American Council on Education were the only agencies active in getting allocation of reserved television channels.

The National Citizens Committee provides, as it reports, "a connective tissue between the efforts of local groups." With its field staff, it is able to provide legal and engineering guidance, fund raising counsel, and personnel services. It publishes a fortnightly newsletter, distributes films, exhibits, speakers kit, and maintains a speakers bureau.

The Citizens Committee has recently published and made widely available a handsome brochure in which are summarized some of the educational TV broadcasts now being given in various communities, as well as a description of the committee itself. Among the agencies cooperating in the Advisory Council are the American Public Health Association,

American Dental Association, National Health Council, and National Safety Council. Ira V. Hiscock, Sc.D., president-elect, represents the APHA on this council.

### Leaching of Sanitary Landfills

One of the problems that has confronted many municipalities contemplating the sanitary landfill method for the disposal of garbage has been that of possible contamination of water supplies from wells. The Sanitary Engineering Research Laboratory, University of Southern California, has studied leaching of a sanitary landfill and its possible effect on adjacent well supplies. The work was done under a grant from the State Water Pollution Control Board. Briefly, one encouraging determination was that if the landfill is located so that no portion of it intercepts ground water there is little possibility that leaching will impair the water to the point of interfering with domestic or irrigating water use. The report of the study has been published as Publication No. 10, "Report on the Investigation of Leaching of a Sanitary Landfill," State Water Pollution Control Board, Sacramento, 14. A limited number of free copies is available to individuals or departments responsible for garbage disposal.

### Community Safety Programs

The National Safety Council has been distributing "A National Program for Preventing Home Accidents" in which the main emphasis is on working together. Builders, insurance companies, industrial plants, scouts, as well as the more traditional men's and women's groups and health agencies are involved in planning such programs.

The brochure brings out the fact that home accidents are primarily an urban problem with half of all the fatal accidents in a group of 35 cities occurring at home. Printing, use of color, and illustrations are each excellent. Available in limited quantities. National Safety Council, 425 N. Michigan Ave., Chicago 11, Ill.

"Guide to Community Safety Programs" was made available in February by the U. S. Department of Labor. It is reprinted from the Proceedings of the 1954 President's Conference on Occupational Safety. This one is largely geared to work-accidents and concentrates on how a safety conference and program are organized. A limited supply is available without charge on a first come, first served basis. Paul E. Gurske, Director, Bureau of Labor Standards, U. S. Department of Labor, Washington 25, D. C.

### Puppets Urge Better Breakfasts

"Bill's Better Breakfast Puppet Show" is a new health and nutrition education film for elementary grade children. In 16 mm color and sound, it is a recording of the live puppet show seen by 125,000 children in 150 New York City public schools. The film, 25 minutes in length, is designed by the Cereal Institute to fill the need for nutrition education and visual materials for younger children. It is available on a for-sale-only basis, the Cereal Institute sharing the print cost. Educational Director, Cereal Institute, Inc., 135 S. La Salle St., Chicago 3, Ill. Price not stated.

### A Film on Juvenile Delinquency

"Hard Brought Up" is a 16 mm, black-and-white, 40-minute film dealing dramatically with typical situations relating to an act of juvenile delinquency. Its intended audience is parents and parent groups, teachers, social workers, lawyers, civic officials, and personnel of courts and law enforcement agencies. The characters are portrayed by citizens of Jackson, Miss. The film was sponsored by the Mississippi State Department of

Welfare and the U. S. Children's Bureau, produced by Nicholas C. Read, Potomac Film Producers, and is available from Mental Health Materials Center, 1790 Broadway, New York 19, $150, f.o.b. Preview prints available to organizations considering purchase by payment of transportation charges both ways.

The center also has available "Back to Life" which it believes "to be the first 16 mm dramatic film about re-employment of recovered mental patients." It is designed for relatives and friends of mental hospitals, foremen and supervisors in firms, rehabilitation and employment counselors, mental hospital staffs, and the general public. In black and white, it runs 30 minutes. It was sponsored by the Pennsylvania Bureau of Mental Health and produced by Al Kane Productions, $125, f.o.b., New York.

## Annual Reports

"Speaking from the Heart" is the 1954 annual report of the American Heart Association. It succeeds in portraying both the research and community service aspects of the association's program. From the production standpoint, the report is outstanding—good paper, type, and format, clear-cut illustrations, good use of color, and decent respect for the English language. The growth of the association and its support by the public since 1949, when AHA first expanded from a purely research organization into a voluntary health agency, is indicated in the total of funds raised year by year. In 1949 the sum was $2,656,000; by 1951 this had more than doubled; by 1954 the $11,330,000 raised was more than double the 1951 figure. American Heart Association, 44 E. 23rd St., New York 10, N. Y.

"Vermont's Program of Help for Alcoholic Problems" is the first biennial report of the state's Alcoholic Rehabilitation Commission created by legislative act in 1951. In eight offset pages, largely tables and charts, is told the story of what the commission has done in its first two years. An organization chart outlines the steps in the treatment.

The commission estimates that the state has nearly 7,000 problem drinkers in the state, nearly 2 per cent of the total population and nearly 3 per cent of the population 18 years of age or over. Of these, fewer than 5 per cent were treated by the commission in the 32 months covered by the report. In only one county, the most populous in the state, were as many as 10 per cent treated.

The commission proposes to divide the state into three districts, each of four or five counties and each with a population of from 111,000 to 140,000. The plan is to have a field worker in each district. Joseph P. Verdery is the executive director. Howard Relief Bldg., 174 Pearl St., Burlington.

"California's Health" for September 15, 1954, is expanded to serve as the 1953–1954 annual report of the California Department of Health. Using existing publications for annual reporting rather than a separate annual report is currently frequent practice and is probably both cheaper and more likely to be read.

In the present instance, the report consists largely of graphic presentation with a minimum of text. Besides telling California citizens what their State Health Department does, this report might well serve as a recruitment piece to give young persons a picture of what public health is and the variety of skills needed to staff the services. Malcolm H. Merrill, M.D., is the state health officer.

# Books and Reports

All reviews are prepared on invitation. Unsolicited reviews cannot be accepted.

**Control of Communicable Diseases in Man (8th ed.).** An Official Report of the American Public Health Association. New York: American Public Health Association (1790 Broadway), 1955. 219 pp. Price, $.60.

One of the most valuable contributions of the APHA to sound practice has been the publication and progressive revision of this manual. Now comes the eighth edition. The text of the seventh edition has been critically reviewed and amended by a committee of distinguished epidemiologists and administrators with the collaboration of representatives of officially interested national and international organizations. While the purposes and format are essentially the same as in previous editions, there are notable changes in the text. One of the new features is a presentation of a basic scheme which is rational and flexible for the reporting of communicable diseases. Because of expanding participation in international health activities, coverage has increased from 92 diseases in the seventh edition to 118 in the eighth. Several of those added are rare exotic infections due to helminths or fungi and classified as "Official report (to public health authority) not ordinarily justified." Since this booklet is a field manual for the control of communicable disease, not a textbook on medical diagnosis, and need not become a dictionary of medical curiosities, it is questionable whether such diseases as chromoblastomycosis and diphyllobothriasis should be included for the sake of more complete coverage.

The text is remarkably free from technical error. Measures of control have been revised to conform with current scientific concepts so far as practicable. Recognizing that antibiotics and chemotherapy have become an important feature in the control of some infections, this subject has received systematic attention.

These and other changes too numerous to mention have increased the accuracy and usefulness of this manual. Every worker in this field of public health should have a copy of this new edition for ready reference.

KENNETH F. MAXCY

**The Physician and His Practice**—Edited by Joseph Garland. Boston, Mass.: Little, Brown (34 Beacon St.), 1954. 270 pp. Price, $5.00.

This is a uniquely useful book for the public health worker—a picture of the physician in his most usual habitat, in medical practice in his community. In a series of essays by medical and other authorities it presents an uneven, but generally well drawn picture of the growth and development of the physician, of how he functions as a physician—or should function—choosing his field, practicing alone, in a group, in the hospital, in the community.

Prepared essentially for the young physician entering practice and as an objective re-examination of the physician and his practice for those well established, the book covers a wide range of subjects from the role of the physician's wife and family to the selection of a secretary; from the place of the American Medical Association, to the functions of a petty cash book. Public health nurses and others may find the several essays on the business of medicine most

helpful in achieving an understanding of what goes on in the doctor's office. The health educator can take new hope in the search for community leadership on reading the idealizations of the physician's responsibilities in the American community. The two essays of Dr. Henry F. Howe on Family and Community Relations and on Community Resources should be read by all health department personnel. The reviewer heartily recommends this collection for the bookshelf of every health department—for use and for display—both will pay dividends in better relations.

JONAS N. MULLER

**Public Relations in Medical Practice**—By James E. Bryan. Baltimore, Md.: Williams and Wilkins (Mt. Royal and Guilford Aves.), 1954. 301 pp. Price, $5.00.

Mr. Bryan has written an important guide in the evolution of medical practice from an applied science to an instrument of public welfare, from a profession primarily engaged in the treatment of disease to one that is rededicated to the well-being of people.

He takes as his premise the concept that public relations in medicine must be developed within the framework of the Hippocratic oath, that the physician's first responsibility is to his patient and that the ultimate aim of good public relations must be to benefit the patient. He applies this philosophy to a detailed and practical analysis of the physician's relations to his patients, his office, his colleagues, his community, his medical society, his hospital, and himself. Two chapters devoted to his financial and economic relationships will be a primer of medical economics to many physicians.

This is an easy book to read, written in an engaging and persuasive style. If Mr. Bryan occasionally belabors a point, it is probably because he recognizes the need of driving it home to a cloistered group who are largely unaware of their role as full members of a society, or are indifferent to their community responsibilities.

This book should be required reading, particularly for the junior medical student in order to give him an adequate concept of the place in society for which he is being trained, and to impress on him the fact that medical public relations are a mode of ethical conduct, and not a bag of "gimmicks." It has much to offer to everyone on the medical team, not only to the physician, but to his co-workers in public health, nursing, dentistry, social welfare, hospital administration, and volunteer health agencies. The reviewer knows of no other single volume that gives as much promise of improving understanding and cooperative relations between these groups.

JOHN LESTER REICHERT

**Medical Care for Tomorrow**—By Michael M. Davis. New York: Harper (49 West 33rd St.), 1955. 497 pp. Price, $6.50.

In all the tumult and shouting about methods of extending and improving medical care it is refreshing to hear a clarion call for consideration of the fundamental issues involved in organizing comprehensive medical care for all the people at a price all can afford. Approaching the subject from the point of view of the public, Dr. Davis describes and analyzes the economic, social, scientific, technologic, and intraprofessional forces which have brought about changes in social organization of medical care in the past and, inevitably, will bring further changes in the future.

In the first three parts of his book he discusses in detail the basic elements in medical services and the evolution in both organizations and economics, carefully scrutinizing trends, defining dynamic thrusts, stating accomplishments and shortcomings, and paying due attention to the problem of leadership, includ-

ing that of responsibility of the health department to the people. In the fourth part of the book the author discusses possibilities of private and public action, weighing the relative merits of various methods of organization. He favors national health insurance, developed by stages, in the belief that a "broad and frontal attack on the economic problem of medical care, that is, the methods of paying for it" offers the best chance of making progress. This opinion is debatable on many grounds other than emotional. But the fact remains that the problem so ably analyzed in this book cannot be solved by looking at it through a pair of "Fishbeinoculars."

With respect to scope of content, documentation of the facts (some 900 references), presentation of the subject matter, analysis of the situation, emphasis on broad perspectives, and avoidance of "gobbledygook," the book has no equal among the countless recent publications on the sociology and economics of medicine. FRANZ GOLDMANN

**Dynamics of Group Action:** Citizens Committees, 48 pp; and Problem Solving for the Executive, 44 pp.—By Daniel R. Davies and Kenneth F. Herrold. New London, Conn.: Croft (100 Garfield Ave.), 1954. Price, $2.50 each, or $27.50 for the series of 12 when available.

These two handbooks are among the first in a series of twelve to be issued under the general title "The Dynamics of Group Action." Designed as a series of "working papers" on human relations for administrators and board members of hospitals, school systems, and other institutions which operate under a professional administrator and a lay board, they endeavor to present the latest findings of research on behavior within groups and between groups. Knowledge of this kind has been growing as a result of investigations carried on or sponsored by government, business, educational organizations, and scientific groups. The purpose of these handbooks is to translate the findings into practical recommendations for action.

The volume on Citizens Committees is a forum type presentation of the ways of organizing, operating, and getting the most of such groups. It deals with such questions as: Why should we have citizens committees? Why do some committees run into trouble? What do such committees cost? Who should serve on them? How do committees operate, once started? These topics are handled one by one, and practical ways of dealing with problems are presented. This is the strongest point of these handbooks. It is obvious that the authors have had a great deal of practical experience in working with committees. On the level of ideas, the authors do not come to grips with certain contradictions implicit or explicit in what they say. On the one hand we are told that, "Only the people themselves have the right to determine what they want the schools to do for their children . . ." but throughout this guide there is an implicit assumption that only certain kinds of committees are "good." For instance, a committee intended to upset the status quo is frowned upon, while the ideal advanced is restrained cooperation. One may accept the goal and yet recognize that perhaps there are real problems that cause conflict and have to be dealt with by upsetting the status quo.

"Problem Solving for the Executive" is organized along much the same lines as the preceding handbook. As the title indicates, it is addressed to the executive and discusses his role in problem-solving, who should participate in this activity, how to plan for it, and what by-products may emerge. The contents are extremely practical and tell the executive how to do things.

Both handbooks are useful additions to the literature on group behavior. However, one caution might be added. These

guides will be most useful where the user already has a modicum of theoretical or practical knowledge. Both publications are well printed and have space for notes.

GEORGE ROSEN

**Why We Became Doctors**—Edited by Noah D. Fabricant. New York: Grune and Stratton (381 Fourth Avenue), 1954. 182 pp. Price, $3.75.

Here are 50 brief essays by as many physicians telling in their own words why they became doctors. The accounts are quite varied and very readable. The public health field is represented by extracts from the writings of Oliver Wendell Holmes, S. Josephine Baker, Alice Hamilton, Hans Zinsser, Samuel J. Crumbine, and Sir Ronald Ross, to select a few.

It can be recommended for reading by young persons who are considering medicine and will be equally refreshing to those who, having chosen such a profession, are interested to compare their own motivation with that of these outstanding persons.

REGINALD M. ATWATER

**Television—A New Community Resource. A Story of a Television Workshop for Community Organization Personnel**—By the Television Committee of the Council of National Organizations. Leonia, N.J.: Wells Publishing Company, 1953. 96 pp. Price, $1.00.

This report performs a dual function: it gives a day-by-day and in some cases a blow-by-blow recital of the planning, operation, and evaluation of a 10-day workshop and it reports what 18 representatives of Los Angeles community organizations (and three national organization representatives) learned about involving community groups in the use of television for educational purposes.

Working with professional and technical personnel of Channel 28, a nonprofit UHF TV station built and equipped to serve as an educational outlet for the Los Angeles area by the Allan Hancock Foundation, the workshop participants planned, wrote, directed, and produced their own TV show. The station served as a real workshop for the group.

The primary value of this report is the detailed accounting it gives of the workshop procedure in use. Summarized from tape recordings and recorders' notes, it presents a vivid picture of people in a workshop situation ranging from the early frustrations of participants seeking the authority of a formal and familiar structure to the evaluations of these same people indicating their acceptance and effective use of the workshop method.

What about the use of TV by community groups for educational purposes? The report tells of some of the factors which the group explored, but if you want the answers for your own community, better have your own workshop. This report will help you to do it.

RALPH T. FISHER

**The Talladega Story**—By Solon T. Kimball and Marion Pearsall. University, Ala.: University of Alabama Press, 1954. 259 pp. Price $3.50.

Talladega, an agricultural-industrial town of about 13,200 situated in the Appalachian foothills of Alabama, established a Community Council and conducted a self-survey on health problems. A research team of sociologists from the University of Alabama, sponsored by a grant from the Health Information Foundation, was privileged to take part in the drama—observing, recording, gathering data, documenting, analyzing, and at times suggesting new approaches or actions. The book is an interesting interpretive account of community successes and failures over a two-year period.

The Community Council developed through the survey gave new impetus to ongoing programs and made possible a

re-examination of many community problems. The report suggests that the inventory of health problems itself had little if any effect on the basic structure and values of the community but helped to stimulate and increase the tempo of activity which gave new strength to existing arrangements. A major weakness of the council structure was the failure to secure adequate representation of white workers, Negro groups, and persons connected with the local Negro college. The cultural fact of racial separation necessitated encouraging the Negroes to conduct their own survey and only limited coordination resulted.

The reader will be impressed with the frankness of this story, for the authors have tried to be thorough, reporting problems, conflicts, difficulties, and failures as well as successes. One must admire the people of Talladega who permitted the tradition of anonymity to be violated so that the story could be told.

The research team planned its observations and data gathering in terms of a number of hypotheses, many of which they report as confirmed. In a final chapter, these are summarized as "principles" of organization. The serious reader, however, may be concerned about the limited information on methodology and research data from which such principles are derived. Use of the narrative approach has resulted in some generalization which is not clearly distinguished from the conclusions of research.

On the whole, the Talladega Story is an exciting one to read and offers much of interest to public health workers.

ANDIE KNUTSON

**The Skin**—By Arthur C. Allen. St. Louis, Mo.: Mosby (3207 Washington Blvd.), 1954. 1048 pp. Price, $25.00.

This volume which classifies itself properly as "a clinicopathologic treatise" is edited by the associate professor of pathology at Cornell, who is also a pathologist at Memorial Hospital in New York City.

The author's purpose has been to bring objective clarification to the subject of dermatology by a clear presentation of the pathologic lesions involved and to reduce the barriers between dermatology and other disciplines. In more than 1,000 pages of text and illustration, the author's purpose has been well accomplished. The majority of the illustrations are photomicrographs of uniformly good quality.

The treatment of such diseases of public health importance, such as syphilis, tuberculosis, and leprosy appears to be adequate. The same can be said for the parasitic and tropical conditions. Discussions of diseases like smallpox and alastrim may leave the epidemiologist uncertain as to their essential identity. The volume, however, will represent a prime resource to epidemiologists who wish to explore the histology of skin lesions.

REGINALD M. ATWATER

**Health for Better Living:** Growing Your Way (Book Four) 256 pp. Price, $1.80; Keeping Healthy and Strong (Book Five) 288 pp. Price, $1.92; and Teamwork for Health (Book Six) 327 pp. Price, $2.04—By Grace T. Hallock and Ross L. Allen. Boston, Mass.: Ginn and Company (Statler Bldg., 15 Ashburton Place), 1954.

These three volumes in the Health for Better Living series are school readers. They are graded not only in language, but in content, illustrations, and student activities. Subject organization of each book is by units. Although units are repeated in title and content in each of the three books with variation, the emphasis in each is different.

Questions are occasionally noted in the text, giving the student a chance to test his knowledge and understanding as he reads. But of great value are the special

activities at the end of each unit. The authors have titled these self-testing devices as "What Do You Know?", "What Do You Do?", "What Do You Think?" (the latter in book six), and "New Health Words."

In general, the text is accurate and leaves no doubt as to meaning. There are a few statements that unless properly interpreted by a knowledgeable teacher may lead to student misunderstanding or confusion. One point made in book four suggests that the student "Try to have at least five eggs a week." Of course, there is no suggestion that these eggs be distributed throughout the week and that they should not be eaten in one sitting, as some youngsters can do very well, indeed! A reference to rickets is made by noting, without explanation, that "in this disease the bones are soft and easily bent out of shape." What a picture can be conjured up by a fifth grader upon reading that! Serious misunderstandings may arise when the student reads in book six about the value of gamma globulin in polio. An erroneous impression is left that gamma globulin has value under any and all conditions.

One final point—there is no uniqueness about the format or content of these books. Perhaps there is no new way to present health information for the elementary grades, but it would be refreshing if it could be done.

MOREY R. FIELDS

**Human Relations in Action**—By H. Edmund Bullis and Cardelia W. Kelly. New York: Putnam's (2 West 45th St.), 1954. 86 pp. Price, $1.50.

This book is a very elementary primer in the essentials of mental health, the authors' modest claims for which are realized. Written by two educators whose comprehension of mental hygiene principles is based more on intuition and experience than on specialized training, this very easily read and understood book is by no means comprehensive. The text is brief, conversational, and superficial. The convenient personal check lists and discussion questions at the end of each short chapter will be provocative of thought for discussion groups. Without employing academic terminology the contents may serve as a study outline for consideration of such topics as instinctual conflict, self-critical institutions of the personality, common mechanisms of social adaptation, dynamics of conscious control and self-direction, and normal and abnormal mechanisms of defense. Such psychologic concepts as sublimation, identification, fantasy-formation, projection, insight-formation, and denial receive cursory attention.

The book's greatest weakness lies in its minimal consideration of what may be regarded as abnormal emotional conflict. Since it accents self-development and the utilization of constructive forces intrinsic in the human personality, it fails to direct attention to the competent agencies, therapeutic systems, and treatment facilities to which troubled persons may turn for help.

Its greatest strength lies in its being a very inexpensive and comprehensible presentation of relatively noncontroversial factors in personal adjustment. The book is obviously directed toward readers below the college level and may be quite useful to high school adolescents and as an introduction to mental hygiene for student nurses.

MAURICE E. LINDEN

**Medical Mycology.** Edited by R. D. G. Ph. Simons. Houston, Tex.: Elsevier Press, (402 Lovett Boulevard), 1954, 446 pp. Price, $9.75.

Here is a volume which will be a gold mine to public health workers confronted with obscure fungous infections. It is the most comprehensive résumé from the clinical standpoint which has come to the attention of the reviewer. Thirty-six authors from the United States, Brazil,

Spain, Egypt, Mexico, France, New Zealand, Kenya, Israel, and The Netherlands have compiled this text which is intended to cover "all tropical and non-tropical fungous diseases, mycotization, mycological technique, experimental mycology, and important aspects of the blastomycoses, together with an illustrated review of the cultural characteristics of pathogenic and saprophytic fungi." The illustrations are excellent. The volume can be highly recommended.

REGINALD M. ATWATER

**Nutrition Under Climatic Stress—A Symposium**—Edited by Harry Spector and Martin S. Peterson. Chicago, Ill.: Quartermaster Food and Container Institute for the Armed Forces (1819 W. Pershing Road), 1954. 203 pp. Limited free distribution.

This book presents the contributions to a symposium held at the National Academy of Sciences, Washington, December 4–5, 1952. The papers are grouped under four headings: "Practical Problems of Service Operations Under Climatic Stress," "Animal Experimentation," "Human Experimentation," and "Summary of Present Knowledge—Need for More Research." A few names from the long list of contributors may be mentioned: Samuel Brody; E. F. Adolph; Elaine P. Ralli; L. P. Dugal; B. F. Chow; H. H. Mitchell; R. M. Kark; Herbert Pollack; and Ancel Keys.

The field covered by the symposium was a wide one and in many areas only tentative conclusions could be reached. For the present reviewer, and possibly for many other public health workers, the following considerations seem most noteworthy. The caloric requirements of man are shown to rise and fall inversely as the external temperature. Thus, energy needs are great when men live and work in very cold climates, in part due to the direct stimulation of the cold and in part a result of the hobbling effect of clothing on the body movements associated with physical activity. On the other hand, the total caloric expenditure is proportionately smaller in hot climates, and here the factors responsible are a depression of the basal metabolic rate, a greater efficiency for some types of work because fewer clothes are worn, a lesser capacity for work, and diminished motivation. Experimental studies suggest that adjustment to cold climates may be facilitated by diets high in fat or in carbohydrate, while increased intakes of protein and of water-soluble vitamins are not beneficial. No extensive, well controlled experiments could be cited indicating that dietary modifications might lessen the impact of heat stress. A paper by Mitchell does, however, summarize important results regarding the vexed question of the loss of nutrients in sweat. Losses of water-soluble vitamins through perspiration do not seem to be large enough to be of practical significance, while losses of iodine, calcium, and iron are of sufficient magnitude to invite further study and consideration.

The many difficulties which must be overcome in maintaining the nutrition of the fighting man in the Arctic receive a good deal of attention, as well as the problems posed by survival behind enemy lines, survival at sea, and dietary provisions for operating personnel and the wounded during flight. Those interested in physiology will find discussions of the relations between stress, the adrenal, and nutrition. The book seems a timely one in view of the present world situation. A. HUGHES BRYAN

**Health Insurance in Great Britain, 1911–1948**—Social Security Series Memorandum No. 11, Ottawa, Canada: Research Division, Department of National Health and Welfare, 1952. 163 pp.

This multilithed report provides a brief and technical history of the health

insurance systems which became the National Health Service of Great Britain. It is written in clear and straightforward style without much interpretation or literary color.

The process of growth and change is indicated in terms of the legislative acts, the background of health services and resources, and the extent of health insurance coverage. The complexities of the earlier benefit structure stand out sharply in this summary form. The chapter on administration sketches in brief, stark lines the problems of a structure characterized by a multiplicity of voluntary agencies operating under public supervision. Those who are interested in current legislative proposals for the extension of voluntary health insurance in this country should find this chapter enlightening. It is not difficult to understand.

A final section on assessment of the system depends upon quotations from authoritative sources. This chapter stands as an uncomfortable reminder of the many problems which the new health service has yet to solve—for example, the persistent separation of public health and preventive medicine from the everyday practice of medical care and the continued failure to break down the barriers between general and specialist services. The need for modification of the earlier system is certainly clear, particularly in regard to the cumbersome, illogical, and costly financial operation and the fragmentation of administrative responsibility, as well as the failure to approach the health problems of major segments of the British community. These were among the major problems which the National Health Service was designed to face.

An appendix of tables on expenditures, receipts, covered population, and the income of practitioners completes the volume. This report is just what it sets out to be—a clean, tight, factual report for students and professional workers in the field of health insurance. It is one of six such reports on health insurance in various countries.

JONAS N. MULLER

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# Books Received

Listing in this column acknowledges the receipt of books and our appreciation to the senders. Space and the interests of readers will permit review of some, but not all, of the books listed.

ABHANDLUNGEN AUS DEM GEBIETE DER PHYSIKALISCHEN THERAPIE. A. Kukowka. Leipzig, Germany: Veb Georg Thieme, 1954. 228 pp. DM 28—

ACETON BIS ZUCKER. NACHSCHLAGEBUCH FUR ZUCKERDRANKE. Gerhardt Katsch, G. Mohnike, and H. J. John. Leipzig, Germany: Veb Georg Thieme, 1954. 204 pp. DM 9.50.

ANTISERA, TOXOIDS, VACCINES AND TUBERCULINS IN PROPHYLAXIS AND TREATMENT (3rd ed.). H. J. Parish. Baltimore, Md.: Williams & Wilkins, 1954. 227 pp. Price, $5.00.

CIBA FOUNDATION SYMPOSIUM ON CHEMISTRY AND BIOLOGY OF PTERIDINES. G. E. W. Wolstenholme and Margaret P. Cameron, Editors. Boston, Mass.: Little, Brown, 1955. 425 pp. Price, $8.00.

CURRENT THERAPY 1955. Howard F. Conn. Philadelphia, Pa.: Saunders, 1955. 692 pp. Price, $11.00.

DEMOGRAPHIC YEARBOOK 1954. United Nations. New York: Columbia University Press (2960 Broadway), 1955. 729 pp. Price, $7.50 cloth, $6.00 paper.

DENTAL SERVICE AT THE SAINT LOUIS LABOR HEALTH INSTITUTE. James M. Dunning. St. Louis, Mo.: St. Louis Labor Health Institute (1127 Pine St.), 1955. 10 pp.

FOOD SERVICE IN INSTITUTIONS. Bessie Brooks West and Le Velle Wood (3rd ed.). New York: Wiley, 1955. 682 pp. Price, $7.50.

HUMAN MACHINE, THE. Biological Science for the Armed Services. C. W. Shilling. Annapolis, Md.: United States Naval Institute, 1955. 292 pp. Price, $5.00.

INTRODUCTORY FOODS. Osee Hughes (3rd ed.). New York: Macmillan, 1955. 551 pp. Price, $4.75.

ION EXCHANGE AND ADSORPTION AGENTS IN MEDICINE. THE CONCEPT OF INTESTINAL BIONOMICS. Gustav J. Martin. Boston, Mass.: Little, Brown, 1955. 333 pp. Price, $7.50.

MANUAL FOR SEWAGE PLANT OPERATORS. Prepared by Texas Water and Sewage Works Association. Austin, Tex.: Texas Water and Sewage Works Association. 511 pp. Price, $5.50 members, $6.50 nonmembers.

NATION AND THE STATES, RIVALS OR PARTNERS, THE. William Anderson. Minneapolis, Minn.: University of Minnesota Press, 1955. 263 pp. Price, $3.75.

OCCUPATIONAL AND RELATED DERMATOSES. Abstracts from the Literature July 1943 to December, 1953, Inclusive. Public Health Service Publication No. 364. Donald J. Birmingham and Paul C. Campbell, Jr. Washington, D. C.: Superintendent of Documents, 1955. 183 pp. Price, $.65.

OCCUPATIONAL ORAL-HEALTH IN GENERAL DENTISTRY AND PUBLIC HEALTH. Vol. II. Papers presented before the Second Public Health Workshop. Alfred J. Asgis. New York: First District Dental Society (Hotel Statler), 1954. 60 pp. Limited edition.

PHYSICAL EDUCATION FOR CHILDREN. A HANDBOOK OF OBJECTIVE ACTIVITIES. D. Cyril Joynson. New York: Philosophical Library, 1954. 215 pp. Price, $4.75.

POLIOMYELITIS. World Health Organization Monograph Series No. 26. Robert Debre, et al. New York: Columbia University Press, 1955. 408 pp. Price, $8.00 cloth.

PREVALENCE OF PEOPLE, THE. Marston Bates. New York: Scribner's, 1955. 283 pp. Price, $3.95.

REPORT OF THE SUBCOMMITTEE TO REVIEW THE FINANCING OF MARYLAND HEALTH ACTIVITIES. Baltimore, Md.: Committee on Medical Care, Maryland State Planning Commission, 1955. 47 pp. Price, $1.00.

SCHOOL HEALTH SERVICES. A REPORT OF THE JOINT STATE GOVERNMENT COMMISSION TO THE GENERAL ASSEMBLY OF THE COMMONWEALTH OF PENNSYLVANIA. Harrisburg, Pa.: Joint Government Commission, Capitol Building, 1955. 39 pp.

SICKNESS EXPERIENCE IN SELECTED AREAS OF THE UNITED STATES. Public Health Monograph No. 25. Selwyn D. Collins, Katharine S. Trantham, and Josephine L. Lehmann. Washington, D. C.: Gov. Ptg. Office, 1955. 96 pp. Price, $.50.

SILENT SERVICE IS NOT ENOUGH. American Water Works Association Public Relations Study. New York: AWWA, 1954. 135 pp. Price, $1.50.

SOCIAL AND PSYCHOLOGICAL FACTORS AFFECTING FERTILITY. Vol. 4. P. K. Whelpton and Clyde V. Kiser, Editors. New York: Milbank Memorial Fund, 1954. 802–1086 pp. Price, $1.00.

STATE-LOCAL SERVICES FOR MENTAL HEALTH. Margaret Greenfield. Berkeley, Calif.: Bureau of Public Administration, University of California. 93 pp. Price, $1.50.

SURVEY OF COLLEGE HEALTH PROGRAMS FOR PROSPECTIVE TEACHERS WITH SPECIAL REFERENCE TO EYE HEALTH, A. New York: National Society for the Prevention of Blindness, 1955. 131 pp. Price, $1.00.

TEXTBOOK OF HEALTHFUL LIVING. Harold S. Diehl (5th ed.). New York: McGraw-Hill, 1955. 802 pp. Price, $6.00.

TEXTBOOK OF PHYSIOLOGY, A. Edited by John F. Fulton. Philadelphia, Pa.: Saunders, 1955. 1275 pp. Price, $13.50.

WATER SUPPLY ENGINEERING. Harold E. Babbitt and James J. Doland (5th ed.). New York: McGraw-Hill, 1955. 608 pp. Price, $8.50.

YOUR FAMILY—TODAY AND TOMORROW. Elizabeth S. Force. New York: Harcourt, Brace, 1955. 398 pp. Price, $3.22.

YOUR FIGURE, LADIES. Paul Fogarty. New York: A. S. Barnes, 1955. 87 pp. Price, $1.00.

YOUR HEALTH TODAY. W. W. Bauer. New York: Harper, 1955. 514 pp. Price, $5.00.

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# A Selected Public Health Bibliography with Annotations

**Down a Fifth Since '40**—"The splendid health record for 1954 was due in part to the freedom from major outbreaks of respiratory disease . . . (and) reflects the remarkable advances made in the medical sciences, public health administration and the high standard of living. . . ." Malignant neoplasms only, among major death causes, were higher.

ANON. All-Time Low Mortality in 1954. Statist. Bull. Metrop. Life Insur. Co. 36, 1:1 (Jan.), 1955.

**Where There's No Candy**—Believe it or not, there is a place where the old wive's warning about "a tooth for every child" turns out to have some validity. It is an island far off in the South Atlantic and the diet is mostly fish and potatoes.

ANON. Oral Health and Nurture in Tristan Da Cunha. Nutrition Rev. 13, 3:76 (Mar.), 1955.

**Talking and Listening**—This provocative discussion about physician-patient relationships has to be stretched a little taut to drag it into the public health tent, but it is likely that clinicians, nurses, and social workers will find something in it to apply to their relationships with the people they serve. It's worth reading just for the fun of it, too.

BIRD, B. Talking with Patients. Am. Pract. 6, 2:270 (Feb.), 1955.

**Anent Counting Rats**—If a rat control campaign is contemplated for your community it may prove useful to have some sort of periodic check on results. How will counts be made? It seems there are residential rats (four-legged kind that is!) and business and industrial rats, and both out-door and in-door rats, just to complicate counting procedures. If a base line is not established and checking methods realistically planned, it isn't likely that anyone will know how well the campaign is paying off.

BROWN, R. Z., et al. The Rat Population of Baltimore. Am. J. Hyg. 61, 1:89 (Jan.), 1955.

**Associations at Work**—The first two of a series of program descriptions of the national voluntary health agencies are those of the Heart and Tuberculosis Associations. Most of us will know in a general sort of way what the 57 varieties of health agencies contribute to the total administrative picture. However, these brief, but detailed accounts of current activities should prove a helpful addition to your "working" information file.

FERREE, J. W. The Physician and the Voluntary Health Agency (and) PERKINS, J. E. Aims and Program of the National Tuberculosis Association. J.A.M.A. 157, 12:1020 (Mar. 19), 1955.

**Ten Jobs for National Associations**—Definitely, this is not to be missed. After the word "national" in the telephone book, the speaker points out that you will find a whole galaxy of works: "academy, alliance, association, authority, board, bureau, club, committee, conference"—and on and on through the alphabet. Will Rogers is credited with the observation that an American is willing to join almost anything but his family. You will like this passing comment, ". . . short reports are better than long ones. This is not because they are easier to read, but because short reports can reveal excellent work, but cannot hide the lack of it. You can cover any cadaver if you have plenty of sheets—of paper."

GREGG, A. The Role of National Associations. Ment. Hyg. 39, 1:18 (Jan.), 1955.

**Traces and Balances**—Two areas of nutrition research stand out says this strategically placed observer at the beginning of a review of recent advances. They are the growing importance of mineral elements and the evidence that nutrients must be regarded in terms of their interplay in the total organism. "Balance" is the word. This you must not miss.

King, C. G. Advances in Nutrition Research. J. Am. Dietet. A. 31, 3:225 (Mar.), 1955.

**To Lay Fluoridation Ghosts**—Here is another report upon the physical condition of adults in those two Texas towns—one with 8 ppm F in the water supply, the other with only 0.4 ppm F. Except for the anticipated dental fluorosis in the former, the medical characteristics of the two groups do not differ more than would be expected in any two comparable communities.

Leone, N. G., et al. Review of the Bartlett-Cameron Survey. A Ten-Year Fluoride Study. J. Am. Dent. A. 50, 3:277 (Mar.), 1955.

**A Little Solace for the Obese**—"We know little about the causes and mechanisms of obesity in man. We know only a little more in the case of experimental animals, and what we learn from them should lead us to be very cautious in our statements." Eight reported findings of research back up this quoted observation quite strongly. Of course, this does not mean that "Fatso" is freed from all obligation to behave himself—dietetically speaking.

Mayer, J. An Experimentalist's Approach to the Problem of Obesity. J. Am. Dietet. A. 31, 3:230 (Mar.), 1955.

**Pedagogic Methodology** — Most consumer-relations activities in public health are in the nature of adult health education, so there may be some help here for a lot of us who forget that we are primarily teachers of adults. It's a "workshop" made up of six suggestive discussions.

McKeachie, W. J., et al. Improving Your Teaching. Adult Leadership 3, 9:13 (Mar.), 1955.

**Promising, They Conclude**—Two groups of comparable children were given dentifrices, one of which had stannous fluoride added. At the end of the year the children using the "fluoride-added" tooth paste had a decrement of approximately half the DMF's of the controls. Editorially the journal comments: "whether the promises held forth by this preliminary study will materialize, or whether they will fade like similar promises in the past, time alone will tell."

Muhler, J. C., et al. Effect of Stannous Fluoride-Containing Dentifrice on Caries Reduction in Children. J. Am. Dent. A. 50, 2:163 (Feb.), 1955.

**Practical Advice, They Want**—It is so seldom that a paper really amusing appears in scientific literature that when one does it seems worth calling attention to, even though it may be hard to find. This one is about marriage advising in Merrie Old England.

Pilkington, R. Genes for Baby (2). M. Officer. 93, 4:47 (Jan. 28), 1955.

**Greeting a Newcomer**—Everyone concerned with improving the care of the chronic sick will welcome this new journal, the first issue of which reports among other things, the wide-ranging findings of a national conference. Recommendations and principles applicable to the public health aspects of the problem are anticipated.

Roberts, D. W. Care of the Long-Term Patient. J. Chronic Dis. 1, 1:51 (Jan.), 1955.

**Community Organizers**—Though these papers abound in beautiful words of sociologic jargon they can be grasped by a scientifically raised reader and with great profit by those already involved in community organization, as well as those

who may be wondering whether or not they should be doing something in this latest way to get public health activities going.

SCHATZMAN, L., et al. Six Papers on Problems of Field Study. Am. J. Sociol. 60, 4:329 (Jan.), 1955.

**In Speculation's Wake**—After reviewing possible relationships that might bear upon cervical cancer, these epidemiologists wisely conclude that little has been established upon which preventive measures might be based other than offering periodic examinations to groups at high risk, prompt care for suspected conditions, and publicity about danger signs. Field research is needed.

TAYLOR, R. S., et al. Cervical Cancer as a Mass Disease. Am. J. M. Sc. 229, 3:317 (Mar.), 1955.

**Unfamiliar Words**—Not often seen on our side of the Atlantic is this sentence: "It is the aim of every officer of health to see all the people in his district well and properly housed whether they be suffering from illness or not." A concluding sentence: "Although every person who is badly housed will benefit by rehousing the current problem is to choose the odd 10 per cent of applicants who alone can be rehoused."

WARREN, W. D. Housing Priority and Mental Illness. Pub. Health 68, 5:75 (Feb.), 1955.

**Visual Aid**—In the January, 1955, issue of this Journal, Knutson and Shimberg told about an experience in teaching home nursing technics via television. In this paper is reported a test of the effectiveness of teaching a single technic—the use of a clinical thermometer—by a motion picture. The movie alone did a good job, but a combination with guided practice got better results.

WHELDEN, C. H., JR. The Use of the Film in Teaching the Care and Use of the Clinical Thermometer. Nursing Research 3, 3:100 (Feb.), 1955.

If additional information is desired regarding the articles listed in this Bibliography, please communicate directly with the publication in which they appeared; the addresses are furnished for your convenience.

Adult Leadership, Adult Education Association of the United States, 743 N. Wabash Ave., Chicago 11, Ill.

Am. J. Hyg. (American Journal of Hygiene), 615 N. Wolfe St., Baltimore 5, Md.

Am. Pract. (American Practitioner), 227–231 S. Sixth St., Philadelphia 5, Pa.

Am. J. M. Sc. (American Journal of Medical Sciences), Lea and Febiger, 600 S. Washington Sq., Philadelphia 6, Pa.

Am. J. Sociol. (American Journal of Sociology), 5750 Ellis Ave., Chicago 37, Ill.

J. Am. Dent. A. (Journal of the American Dental Association), 222 E. Superior St., Chicago, Ill.

J. Am. Dietet. A. (Journal of the American Dietetic Association), 620 N. Michigan Ave., Chicago, Ill.

J.A.M.A. (Journal of the American Medical Association), 535 N. Dearborn St., Chicago, Ill.

J. Chronic Dis. (Journal of Chronic Diseases), C. V. Mosby Company, 3207 Washington Boulevard, St. Louis 3, Mo.

M. Officer (Medical Officer), Whitefriars House, 72–78 Fleet St., London, E.C. 4, England

Ment. Hyg. (Mental Hygiene), National Association for Mental Health, 372–374 Broadway, Albany, N. Y.

Nursing Research, National League for Nursing, 2 Park Ave., New York 16, N. Y.

Nutrition Rev. (Nutrition Reviews), Nutrition Foundation, Inc., Chrysler Building, New York 17, N. Y.

Pub. Health (Public Health), Society of Medical Officers of Health, Tavistock House, Tavistock Sq., London, W.C. 1, England

Statist. Bull. Metrop. Life Insur. Co. (Statistical Bulletin Metropolitan Life Insurance Company), One Madison Avenue, New York 10, N. Y.

# Public Health in Foreign Periodicals

GEORGE ROSEN, M.D., Ph.D., F.A.P.H.A.

A periodical of great interest and value to public health workers, especially those concerned with problems of child health, is the Courrier of the International Children's Centre. Set up at Paris in 1949 and officially inaugurated early in 1950, the Children's Centre grew out of a proposal by the French government in 1947 to create a permanent international center devoted to work for children and operated in liaison with UNICEF.[1] As originally envisaged, the program of the center was a threefold one. It would concern itself with scientific research applied to problems concerning childhood; with social pediatrics, that is the study of problems relating to childhood from their social angle; and, last but not least, with the provision of information, first, for the public in general—and more particularly for mothers—and second, for physicians, health officers, social welfare workers, and other personnel concerned with problems of children.

It is to inform and keep informed all those interested or concerned in work for children and in child welfare that the International Children's Centre publishes the Courrier. The first number of this periodical appeared in November, 1950. Each issue contains from two to five articles. The remainder of the issue is taken up by a bibliography, arranged under major headings, such as allergy, biochemistry, surgery, family, and social questions which gives essential information on articles extracted from a wide range of periodicals. The present column will review a number of articles dealing with social pediatrics, research on child health, and education which were published in the Courrier from 1950 to 1954.

## Social Pediatrics

The concept and tasks of social pediatrics were discussed by Alan Moncrieff in 1951.[2] In his view it is concerned with preventive and curative health work among children with particular reference to environmental factors, both physical and psychological, and their role in departures from physical and mental health. For example, studies of the causes of death in childhood and of diseases and defects at present numerically important in England and Wales reveal problems, the solution of which is not at present receiving as much attention as their seriousness would seem to warrant. Among the problems are familial infection in relation to respiratory disorders, congenital malformations, accidents, and the whole gamut of psychological disorder in children. This situation is probably true in other parts of the world and requires attention from pediatricians and other health workers concerned with children.

## Child Care and Problems of Child Health

The Courrier contains reports on the state of child health in various parts of the world and on measures and programs undertaken to deal with problems of child care. An account from Israel of infant health in Tel Aviv-Jaffa in 1952 is given by Robinson and Hirsch.[3] The number of children per family varies greatly among the social and economic groups of Tel Aviv-Jaffa. The largest number are found among the immigrants (3.32 per family). Next come the inhabitants of the poor suburbs and Arabs (2.62 and 2.56, respectively),

and last the better situated families who live in the center of the city (1.85 per family). While a higher mortality in families with more children was expected, the differences observed in this study seemed exceptionally great. The mortality of children among families living in the center of the city was 3.4 per cent while in the poor suburbs it was 15 per cent, among the Arabs 28 per cent and among recent immigrants 29 per cent. The high mortality is attributed chiefly to poverty and overcrowding. The growth of infants among families living in the center of Tel Aviv is satisfactory and compares favorably with international standards. In the other socioeconomic groups, growth parallels breast feeding. As long as the infant is breast fed the gain in weight and length is satisfactory. As soon as the child is weaned the gain becomes slower. The reason for this phenomenon seems to be that the supply of cow's milk is at present insufficient and erratic, so that breast feeding is the only way for a mother, who is not well situated economically, to provide enough food for her child. Breast feeding is almost universal immediately after birth, but 26 per cent of the infants receive supplementary feeding by the time they reach the well baby clinic. There is a rapid drop for full breast feeding from 72 per cent after birth to 11 per cent in the fifth month of life. Arab infants seem to be fully breast fed at least during the first half year. Early weaning seems to be a result of the following factors: Bed shortage in maternity wards leads to early discharge before the flow of milk is properly established. As a result the hospital personnel is tempted to introduce supplementary feeding. Furthermore, the well-to-do Israeli mother is eager to resume her regular activities as soon as possible, while the working mother is often compelled to wean her baby in order to be able to earn her living. Finally, the regular supervision of the infants tends to encourage the introduction of supplementary feeding when it is found that a child's weight deviates from a standard.

In 1951 Ivcovic reported on an Institute for the Health Protection of Mothers and Children in Belgrade.[4] Comprising four sections devoted respectively to the study of antepartum protection, the protection of infants, of preschool children, and of school-age children, the institute projected a broad program of work. Among the items in its program were inquiries in the field of infant morbidity and mortality, medical gymnastics for infants and children of preschool age, nutrition of expectant mothers and children, biometry of the children, health education for child care, postgraduate courses for physicians and nurses, etc.

Everyone interested in maternal and child health knows that prematurity remains one of the major problems of preventive care in obstetrics and pediatrics. The problem is twofold: (1) study of the causes and, consequently, the prevention of prematurity; and (2) the care of children who have been prematurely born. Miller reported the data obtained in Newcastle-on-Tyne, England, where an endeavor was made to develop a service to give premature infants born at home a good quality of care and still be economically possible.[5] A service of specially trained midwives, organized by the medical officer of health and administered through his Maternity and Child Welfare Department, is offered to the family doctors of the city and is never used without the doctor's knowledge and consent.

In the beginning it was started with one experienced midwife who had been working in the homes of the people for almost 25 years. Later, two more midwives were employed in this work and in 1951 there were three midwives working full-time and two half-time. These nurses may be called in whenever a pre-

mature infant is born at home, and they then look after the mother and the infant, working under the direction of the family doctor. When the nurse is called she usually takes with her some simple equipment to help her look after the child. This equipment, comprised of a cot with draftproof sides, mattress, blankets, sheets, waterproof sheet, thermometer, sterilizer, Belcroy feeder, and infant clothes, is loaned to the family as long as necessary and then returned to the depot in order to be cleaned for use next time. The service was started in June, 1950, and Miller reports on the results obtained from then to the end of 1950, that is, an experience of 5½ months. During this period of 775 children born at home, only 98 were admitted to a hospital. When the results obtained by the midwives are compared with those obtained from admission to a good premature unit immediately after birth at home, it is seen that the results in infants with a birth weight over 3½ lbs. (1,600 gm.) nursed at home are as good as those nursed in the hospital, but under that figure the results in the hospital are better. As a result of this experience, Miller proposed that the domiciliary service undertake the care of most premature children born at home over the wieght of 3½ lbs. Children of birth weight less than 3½ lbs. would be taken to a hospital. In 1950 it was estimated that the cost to look after the infant at home was approximately $35. Another point made relates to the way in which families rally to their responsibilities and the sense of achievement which the care of a premature infant brings. The effect upon the mother, and usually the whole family, is far better than if the child is taken to a hospital immediately after birth and returned six to eight weeks later unknown and strange.

During 1949 the French National Institute of Hygiene carried out a study of stillbirths and early infant mortality (0–30 days).[6] The investigation dealt with infants born in 1949 in five maternity hospitals in Paris (a total of 13,805 births). The purpose was to obtain the most accurate information possible on the medical causes and the social factors of death, and to develop a method of inquiry which might usefully be carried out in other areas where investigations would be extended to the infant population from 0 to one year of age, whatever the place of birth. The inquiry covered 596 deaths; these comprised 146 deaths before labor had started, 142 deaths in the course of confinement, and 308 deaths during the first month of life. The rates per 1,000 births were 10.6, 10.3, and 22.8, respectively. Each death was analyzed to establish the medical causes of death, the social factors which could have contributed to it, and an assessment of the avoidable or unavoidable character of the death. It was possible to determine the relative frequency of the medical causes and of the social factors of death, as well as the percentage of avoidable deaths. Thus, 3.9 per cent of the deaths were judged as almost certainly avoidable, 7.2 per cent as probably avoidable, and 26.9 per cent as possibly avoidable. For purposes of control, a parallel series of infants, born in the same hospitals, chosen at random, and alive on the 31st day were submitted to an investigation of the medical, obstetrical, and social circumstances of their gestation, birth, and postnatal period. The comparison of the two series showed statistically significant differences in the distribution of certain factors. Among these are the harmful effect of pregnancies following one another too closely, as well as the higher mortality among infants of mothers who prior to confinement had not been examined.

Okasaki points out that efforts on behalf of mothers and infants in Japan have greatly reduced infant mortality.[7] The infant mortality rate has declined

from 15.38 per cent in 1899 to 5.71 per cent in 1951, after reaching a peak in 1918 with 18.86 per cent. He also states that no parallel can be established between the infant mortality and the birth rates, each of which evolves differently depending on the period considered. Infant mortality, initially lower in rural communities than in cities, is now higher in the former. This is not due to variations in the birth rate, but rather to the fact that cities have more effective health and welfare arrangements. The distribution of deaths by months of age shows the outstanding significance of mortality in the early months. Nevertheless, the role of age varies with the cause of death; it is paramount in mortality caused by prematernity and congenital debility. Okasaki emphasizes the need for better protection of the expectant mother so as to reduce the number of births of premature and debilitated infants.

## Education and Social Welfare in Child Care

An interesting experiment in health education and child care is the School for Parents in France.[8] This is a private agency recognized by the public authorities whose purpose is to train parents to carry out their task of teaching and to help them overcome difficulties they may encounter. With the assistance of medical psychologists and teachers the school places within the reach of parents the latest scientific information on child psychology and family relationships. The teaching of the School for Parents is strictly concrete and is based upon practical experience. It comprises scientific courses, as well as popular pamphlets in simple language, leaflets, illustrated booklets, and other materials dealing with everyday problems of parents. However, realizing that the problems of parents may be due not alone to their ignorance, but also to their behavior problems which determine their relations to their children, the school has been led to establish direct contacts with parents in the form of individual or collective consultations given by physicians. The purpose of these consultations is to help parents apply their knowledge to their own problems and to support them in their efforts to improve their interpersonal relations. The School for Parents studies the possible and appropriate contribution of the radio and the film. It invites the assistance and observations of all those who in their own countries are engaged in similar ventures.

The collection and the use of human milk for the feeding of infants whose mothers cannot nurse them has been organized in various countries. A very interesting establishment of this kind is the Lactarium of the Puericulture School at Paris.[9] Established in 1946, it has constantly developed. Donors are recruited by collective appeals: radio talks, signs in public places, distribution of leaflets, and notices posted in maternity and well child clinics. However, the most effective method is by direct contact and personal conversation with prospective donors. Possible donors are located and reported to the visiting nurses by the nurses in the well child clinics. When a prospective donor is located, a visiting nurse calls at the home. She inspects it, explains the technic of drawing the milk, and in the nurse's presence a sample of milk is drawn which is then analyzed for the characteristics of the donor's milk. If the findings are satisfactory, the donor is given an appointment to come with her baby to the Lactarium's clinic. Here, the woman and her baby are examined by a physician. In addition to the clinical examination, an x-ray examination of the chest is made and a blood sample for a serologic examination is taken. This preliminary examination is obligatory and no prospective donor

is accepted without it. Following this examination, approved donors and their babies remain under medical supervision. Approximately every five weeks mother and child are called back to the Lactarium for a medical check-up. The milk is collected daily. On arrival at the Lactarium, each bottle is entered on a special register showing the quantities received from each donor. The bottles then go to the laboratory where the milk is tested. This examination of the milk includes acidimetry, a bacteriologic test, measurement of the fat content, and the density. After testing and approval of the milk, the bottles are sealed automatically and treated by intermittent sterilization in vats where they remain for 20 minutes at 65° C. for three days in succession. The Lactarium's milk supply is reserved for low-weight premature infants, for weak or debilitated infants, and for those having serious diseases (infectious or noninfectious). It is supplied on a doctor's certificate. Donors receive a compensation of 600 francs per liter. The Lactarium now rates as one of the largest in the world. Each day 40 liters of human milk are collected. In three years it has distributed more than 25,999 liters of milk. The average number of donors is 130 and more than 3,000 infants to date have received milk from the Lactarium.

Piéron reports the results of a survey undertaken to determine the mental level of French children between the ages of six and 12.[10] The inquiry was conducted in 20 areas regarded as representative of the entire country. There were 2,500 children in each sample, making a total of 100,000. Actually, 97,737 children were covered in the survey, the others having been discarded for various reasons. Of the 95,237 children retained in the statistics, 47,567 were boys and 47,670 girls. This constitutes 2.2 per cent of the total number of children of each age group registered in the elementary schools of France. The survey was based essentially on an intelligence test. At first it consisted of two parts. The first part was the Dearborn performance test, the second a new test for the general evaluation of mental development. The two tests were first given to about 3,000 children of both sexes, aged six to 12½ years, in Paris and a number of villages. Two hundred and eighty of these were then given individual Binet tests for correlation. Mental development curves were made up from the average results at three-month intervals. As a result of this pretesting the Dearborn test was eliminated. In addition, a questionnaire covering each child was filled in by the teacher. This gave information about the family, an estimate of the scholastic ability of the child, remarks on the child's behavior, information about the child's health condition, and a report on sensory defects.

The data derived from the large survey have not yet been completely exploited, but much has been learned. The average result of the tests in relation to age produces a very regular development curve. The curves for boys and girls are practically identical. Both show a practically linear rise to about 9½ years, and beyond that age an attenuated rise toward the upper level of development. There is a slight superiority for the girls below age nine and a slight inferiority after age 10. The children were also classed by social milieu in seven groups. The curves for the seven milieu groups run parallel, but with a definite displacement which reaches an average superiority in relation to the general curve of 25.8 points for the intellectual professions as compared with 9.5 and 2.9 points for the white collar group in places of more than 2,000 and less than 2,000 inhabitants, respectively, and 1.6 for the workers' group in places of 2,000 inhabitants. On the other hand, an inferiority of 6.2 points was seen for

the children from the workers' milieu in places of less than 2,000 population and of 9.7 for the general group of agricultural workers. Furthermore, on the basis of this study it has been possible to establish more accurately the relation between backwardness in school, I.Q., and mental deficiency.

A good deal of attention in the past few years has been directed to the hypothesis that separation from the mother in early childhood has an adverse influence on personality development. A number of interesting reports on this subject have appeared in the Courrier. An over-all approach to the study of the problem is offered by Ainsworth and Bowlby.[11] Four methods are discussed: the systematic case study, the retrospective follow-up, the current study, and the psychoanalytic research study. A brief historical summary of separation research is presented as a background for these methods. The authors believe that at the present stage of development separation research should be determined by the need to explore both the variety of conditions that operate and which probably account for the diverse effects which follow separation experiences and also the nature of the effects themselves. This research should have as its aim the construction of a scientific model of inner processes which relates the operating conditions to the effects and provides opportunities for validation experiments. This purpose, Ainsworth and Bowlby believe, can be achieved best by the current study approach, either alone or in conjunction with the psychoanalytic research study.

An interesting study using the current study approach was reported in 1952 by Roudinesco, David, Nicolas, Robertson, and Bowlby.[12] While investigators in the area of separation research agree that separation from the mother in early infancy and early childhood has an immediate and long-term effect on mental health and personality development, it is recognized that much more has to be found out about the psychologic processes brought into play by this separation from the mother and the chief causes of its most grave effects. Two teams of researchers, one British and one French, undertook to make direct observations of children undergoing separation in order to establish how trouble begins, persists, and to discover the effect of relevant variables. As the authors point out, the more important of these variables are the age of the child, the length of the separation, the nature of the previous relationship between mother and child, the quality of substitute mothering given during the separation, and the handling by the mother of the child's emotional disturbances after his return home.

Once it had been decided to undertake direct studies, it was felt essential to begin at the beginning by establishing typical clinical pictures of children of different ages separated from their mothers for different lengths of time and in different circumstances. Only on this basis could studies be attempted which might permit a deeper understanding of the dynamic processes set in motion by these experiences. In this report the two teams confirm each other's observations. Children aged 12–17 months and 18–24 months were observed. Three phases of emotional response are described: protest, despair, and denial. In the initial protest phase, which may last from a few hours to seven or eight days, the child has a strong need for his mother and the expectation that she will respond to his cries. In the despair stage there is a continuing need of mother coupled with an increasing hopelessness. The child may be withdrawn and apathetic. This is followed by the situation in which there is a denial, first, of the need for mothering by his mother, and second of all need for mothering. This was not true of all children, but in the typical institution or hospital the majority do

so, though a distinction has to be borne in mind between the healthy and the sick child.

In the light of the findings presented above, what can be done for children affected by separation from their parents? Roudinesco and David deal with this problem.[13] After reviewing the harmful effects of what separation followed by institutional care may cause in young children under five years of age, these authors show the importance of avoiding separation whenever possible or of minimizing its consequences by placing children in families rather than in institutions. In many cases, however, this is impracticable. Ways and means must therefore be sought to counteract the harmful effects of institutional life. The authors deal briefly with the method of preparing children and parents for separation, as well as the attitudes needed by institutional staff toward both children and parents at the time of separation. While in an institution the child should from the start be placed in an environment which must remain the same during the entire period of separation. The greatest need of the child is to receive from a new adult substitute care of a quality which will enable him better to withstand separation. It is proposed that institutions be organized into small familial groups of a few children looked after by the same nurse. This type of arrangement is expensive but indispensable for the well-being of the children. The following steps are proposed for immediate action: (1) Divide a large group of children into small groups of five or six, each group leading its own life; (2) see that the children do not become little labeled bundles to whom a series of instructions and manipulations are applied; and (3) maintain continuity in the organization of the home and the personnel so that the child is handled by the smallest number of persons.

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## 83rd ANNUAL MEETING

### HOW TO MAKE HOTEL RESERVATIONS FOR THE KANSAS CITY ANNUAL MEETING

A HOUSING BUREAU will be operated by the Kansas City Convention Bureau for the 83rd Annual Meeting of the APHA in Kansas City, Mo., November 14–18. Since all requests for rooms will be handled in chronological order, you are urged to send in your reservation as quickly as possible on the form below.

| Hotel | Hotel and Rates Single | Double | Twin |
|---|---|---|---|
| **Hotels immediately adjacent to Auditorium:** | | | |
| Aladdin | $4.00– 7.00 | $6.00–10.00 | $ 8.00–10.00 |
| Continental | 5.00– 7.00 | 7.00– 9.00 | 8.00–12.00 |
| Dixon | 4.00– 5.00 | 6.00– 7.00 | 8.00– 9.00 |
| Kansas Citian | 3.50– 6.00 | 5.50– 8.50 | 6.00– 8.00 |
| Muehlebach | 6.50–13.00 | 8.00–13.00 | 10.00–15.00 |
| New Yorker | 5.00–10.00 | 7.00–12.00 | 9.00–12.00 |
| Phillips | 6.00– 7.50 | 8.00– 9.50 | 9.00–11.00 |
| President | 5.00– 9.00 | 8.00–11.00 | 10.00–13.00 |
| Senator | 3.00– 6.00 | 3.50–10.00 | 8.00–15.00 |
| State | 4.00– 6.00 | 6.25– 8.25 | 7.50– 9.00 |
| **Hotels within three or four blocks of Auditorium:** | | | |
| Pickwick | 4.50– 7.50 | 6.00– 9.00 | 6.50– 9.50 |
| Plaza | 2.00– 3.50 | 2.50– 5.00 | |
| **Hotels within short taxi ride from Auditorium (approximately 45¢):** | | | |
| Alcazar | 2.50– 3.50 | 3.00– 5.00 | |
| Ambassador | 4.00– 6.00 | 5.50– 7.50 | 5.50– 7.50 |
| Bellerive | 5.00– 8.00 | 7.50–10.50 | 9.00–10.50 |
| Town House (65¢ cab fare from Auditorium) | 5.00– 9.00 | 7.50–10.00 | 8.50–14.00 |

Rates for suites available on request.

## HOTEL RESERVATION FORM

MAIL TO: Miss Mary Nugent
Housing, Convention and Visitors Bureau
1030 Baltimore, Kansas City 6, Mo.

PLEASE MAKE RESERVATIONS NOTED BELOW: (Please Print or Type.)

First Choice ..... Hotel  Arrival: ....., at ..... a.m. ..... p.m.

Second Choice ..... Hotel  Departure ....., at ..... a.m. ..... p.m.

Third Choice ..... Hotel

..... Single room @ $.....  ..... Twin Bedroom @ $.....

..... Double Bedroom @ $.....

NAMES OF ALL OCCUPANTS:  ADDRESSES:

.....  .....

.....  .....

.....  .....

MAIL CONFIRMATION TO: Signed: .....

Address .....

..... City Zone State

Confirmation will be mailed within 30 days of receipt of this form by the Division of Housing, Convention Bureau, Kansas City, Mo.

## KANSAS CITY TOURIST COURTS, TRAILER CAMPS, AND MOTELS

Good motel rooms are available at prices ranging from $4.00–$7.00 per day for two, $12.00 for four, within easy distance of Kansas City. You will be assigned to good, convenient motel rooms if you will indicate below your interest in such. Motel reservations will be made by the Housing Bureau and confirmed by the motel.

All the following are members of the Kansas City Motel Association:

| | |
|---|---|
| Ace of the Hi-Way Court | 8216–71 Highway |
| Annette Modern Cabins | 81 and 61 Highway |
| Arrow Court | Highway 24 and 71 Cutoff |
| B-B Lodge | Highway 40 and Blue Ridge Cutoff |
| Capital Service Station and Cabins | 116 and 71 Highway |
| Clay Motel | 4018 N. Oak |
| Collins Court | 9501 E. New 40 Highway |
| Crown Motor Court | 4340 State-Kansas City, Kans.* |
| Davidson Courts | 115 and 71 Highway |
| El Cabanas | ½ Mile East of City Limits on No. 50 |
| Flicklin Tourist Court | 3647 State-Kansas City, Kans.* |
| Four-Acre Motel | 8220 So. 71 Highway |
| Hi-Way Motel | 71 Highway and Bannister |
| Gables Motel | 6831 State-Kansas City, Kans.* |
| Holiday Inn Hotel | US 40 and 71 By Pass (5 miles East of Kansas City, Mo., and 3 miles South of Independence, Mo.) |
| Johnson Motel Tourist Courts | 107 St. and 71 Highway |
| Kozy Kourt | 36 Terrace and New 40 Highway |
| Leeds Motel Courts | 3707 Raytown Road |
| Putthoff's Modern Cottages | 40 Highway and Blue Ridge |
| Rainbow Auto Court | 5912 E. 50 Highway |
| Royal Auto Court | 7831–69 Highway |
| Skyline Court | 3531 N. Oak, N. Kansas City |
| Sky-Vu Motel | New 40 Highway and Marsh, N. Kansas City |
| U. Smile Station No. 1 | Old 40 Highway and Raytown Road |
| U. Smile Motel | 50 Highway at 58th Street |
| U. Smile Court | 40 Highway and Skiles |
| Waight's Tourist Camp | 79 and 50 Highway |
| West Haven Motor Court | 5250 State-Kansas City, Kans.* |
| Wornall Motel Tourist Court | 8215 Wornall |
| Young's Motel | 5024 Merriam Drive, Kansas City, Kans.* |

* Kansas City, Kans., is one mile from Kansas City, Mo.

## MOTEL RESERVATION FORM

MAIL TO: Miss Mary Nugent
Housing, Convention and Visitors Bureau
1030 Baltimore, Kansas City 6, Mo.

Please assign Motel accommodations for ..... persons arriving on November ....., and leaving on November .....

NAMES OF ALL OCCUPANTS: ADDRESSES:

..... .....

..... .....

..... .....

..... .....

MAIL CONFIRMATION TO: Signed: .....

Address .....

..... .....
City Zone State

# Employment Service

The following pages present information for those seeking public health personnel and for those seeking positions in public health. Other information concerning vacancies and personnel available is on file in the Association Office. Anyone wishing to have the benefit of this additional information can obtain it by writing to the Vocational Counseling and Placement Service of the Association.

## POSITIONS AVAILABLE

**Health Commissioner**—for well established department in county of 80,000; staff of 60. Cattaraugus County Health Dept., 302 Laurens St., Olean, N. Y.

**Director of Preventive Medical Services**—$713, $749, or $787, depending on qualifications. M.D. and at least one year of graduate study in public health, pediatrics, or obstetrics, and at least five years of experience, including two years' experience in public health, pediatrics, or obstetrics. Must have State of Nevada license at time of appointment. Headquarters in Reno. Nevada State Personnel Dept., Carson City, Nev.

**Regional Health Officer**—for Fairbanks, Alaska. Will serve also as local health officer for city of Fairbanks, as well as for entire northern region. Newly established position. Minimum requirements: M.D. and M.P.H., plus four years' practice of medicine, two years of which must have been full-time in an administrative position in public health. Additional year of latter may be substituted for M.P.H. C. Earl Albrecht, M.D., Commissioner of Health, Alaska Dept. of Health, Juneau, Alaska.

**Medical Director**—for tuberculosis sanatorium and old age home. Responsible for supervision and coordination of modern methods of therapy. Near Kenosha, Wis., an industrial city of 55,000 on Lake Michigan. Wisconsin license and experience in tuberculosis required. Mrs. Rosella Nugent, R.N., Willowbrook Sanatorium, Kenosha, Wis.

**Medical Health Officer**—for an established city-county health department in Pueblo, Colo., population 102,815. Beginning salary $11,000; requires physician with public health training and experience. R. L. Cleere, Executive Director, Colorado State Dept. of Public Health, 414 State Office Bldg., Denver 2, Colo.

**Medical Health Director**—Unusual opportunity; assume full administrative responsibilities in a progressive state university community of 75,000. Urban health department. Physician on Board of Health. Retirement plan. Salary dependent on qualifications. Arthur Kinzer, 115 W. Main St., Urbana, Ill., or Roland R. Cross, M.D., Director, State Dept. of Public Health, Springfield, Ill.

**Health Commissioner**—City of Wauwatosa Health Department; staff of 16; population 45,000. Possession of a Wisconsin medical license and preferably an M.P.H. degree with some public health experience (substitutions permitted). Salary depends on qualifications. Personnel Director, City Hall, 7616 Harwood Ave., Wauwatosa 13, Wis.

**Director of Health**—For a newly created position. Administer health program in a progressive, industrial city of 68,000 population. $11,040-$13,320. Must be licensed doctor of medicine, preferably with master's degree in public health and two years of experience in public health field. Charles F. Schwalm, City Manager, Municipal Bldg., Hamilton, Ohio.

**Sanitary Engineer**—(registered, professional) requirements: degree in sanitary engineering and public health experience. $520 plus travel expenses.

**Engineer**—(registered, professional) requirements: degree in chemical engineering and six years' experience, two of which must have been in the field of occupational health. $560 and travel expenses. Merit System Supervisor, Kentucky State Dept. of Health, 620 S. Third St., Louisville, Ky.

**Public Health Educator**—Responsible administrative work in directing a program of public health education in a large city health department. Must have M.S. in public health education and three years' experience in the field of public health education. $492–$547.

**Public Health Engineer**—Supervisory and professional work in a large city health department. Must have a B.S. in public health, civil, chemical, or mechanical engineering. Three years of professional experience in public health engineering. $509–$564. Dept. of Personnel, Room 235, Municipal Courts Bldg., St. Louis 3, Mo.

**Public Health Engineers**—Openings in junior and assistant grades. Salary range $4,450–$7,000 as district engineer in large county unit. Will direct all phases of sanitation program for population of 150,000. Director of Environmental Sanitation, Erie County Health Dept., City Hall, Buffalo, N. Y.

**Public Health Sanitarians**—$379. Wayne County Civil Service Commission, 2200 Cadillac Tower, Detroit 26, Mich.

**Sanitarians**—Snohomish County Health Department, Everett, Wash. Experienced sanitarians in a generalized sanitation program in county adjacent to Seattle area on Puget Sound. Well established full-time health department. Experience and B.S. in basic sciences required. Robert G. Beaumier, State Dept. of Health, 1412 Smith Tower, Seattle, Wash.

**Sanitarian**—Experienced in food and general sanitation work. College graduate and examination required. Position will require extensive travel. Nine dollars per diem while away from official headquarters. Leased automobile plan for business and personal use. Salary range $275–$425. State Dept. of Public Health, Cheyenne, Wyo.

**Public Health Statistician**—New position to organize and direct statistical activities in large city health department. B.S. and M.P.H. with emphasis on public health statistics. Recent experience in supervisory capacity in public health program desirable. $509–$564. Dept. of Personnel. Room 235, Municipal Courts Bldg., St. Louis 3, Mo.

**Dental Hygienist**—Graduate of approved school to direct dental hygiene program in a health department housed in new modern building. $4,000, plus eight cents per mile travel in own automobile. J. H. White, M.D., Director, Weld County Health Dept., Box 521, Greeley, Colo.

**Director of Visiting Nurse Association**—For Albany, N. Y. Twenty budgeted positions on staff, plus two supervisors. Requires seven years' public health nursing experience, two of which have been in a supervisory capacity, and B.S. with major in public health. Mrs. Myron Strasser, 28 Marion Ave., Albany, N. Y.

**Health Education Consultant**—In state health department, $375–$500; M.P.H. degree in health education from an accredited public health school; three years' experience as health educator with a recognized public health agency. Gerald R. Clark, M.D., Director, New Mexico Dept. of Public Health, Box 711, Santa Fe, N. M.

**Certified Public Health Nurse**—for a generalized program in a county of 37,000; 100 miles west of Chicago. Car essential. $235–$300 per month with a travel allowance of $65 per month. Lee County Board of Health, 316 W. Third St., Dixon, Ill.

**Staff Nurses**—for rural county having a generalized public health nursing program. Must have a degree and experience, also must be eligible for California public health nursing credential. $341–$376. Reimbursement for use of own car. Roswell L. Hull, M.D., Director, San Benito County Health Dept., Health Center, Hollister, Calif.

**Public Health Nurse**—Picturesque and health-minded area in California. $307–$322. R.N. and a California public health nurse certificate required. Car furnished. Joseph T. Nardo, M.D., County Health Officer, P. O. Box 119, Santa Barbara, Calif.

**Nurse**—for well organized and long established school health department in Santa Barbara, Calif.; $3,600–$4,700, depending on training; annual increment up to $6,100 or $6,400. Car allowance, $150. 35-hour week; work nine calendar months; usual school vacations; tenure after three years; B.A. or B.S. and P.H.N. degrees and own car required. L. C. N. Wayland, M.D., Director of Health, Santa Barbara City Schools, 115 W. Victoria, Santa Barbara, Calif.

**Public Health Nurses**—Generalized program in county health department, headquarters 17 miles west of downtown Detroit. Near University of Michigan and Wayne University. $351–$381. Amelia Krause, Director of Nurses, Wayne County Health Dept., 10 Henry Ruff Road, Eloise, Mich.

## International Health Vacancies

**Chief Public Health Adviser**—FOA Mission, Afghanistan. M.D. and M.P.H. degrees, plus experience in responsible local or state public health administration. Duties: to advise the Royal Afghan Ministry of Public Health on development of an expanded public health service, including establishment of a demonstration public health center for the Helmand Valley Area.

**Epidemiologist**—FOA Mission, Rio de Janeiro, Brazil. Doctor's degree in medicine, science, or public health with training in epidemiology. Duties: to serve as consultant to the Servicio and other agencies on all phases of epidemiology and epidemiologic investigation of communicable diseases.

**Sanitary Engineer** (Regional)—FOA Mission, Iran. B.S. in civil or sanitary engineering, plus experience in environmental sanitation. Duties: to plan and develop a sanitary engineering program in a regional health department, including training of sanitary engineering counterparts.

**Water Supply Engineer**—FOA Mission, Manila, Philippine Islands. B.S. in civil or sanitary engineering, plus experience in directing design and construction of municipal water supplies, including small waterworks. Duties: to advise and assist Philippine officials on expanding potable water supply and developing policy and projects supporting the community water supply program.

**Hospital Administration Adviser**—FOA Mission, Panama City, Panama. M.S. degree in hospital administration, plus three to five years' supervisory experience as administrator of large general hospital; experience as consultant to community or governmental agencies desirable. Duties: to assist the national counterpart in improving administrative and medical professional direction of 900-bed general national government hospital; to advise national officials on implementation and development of modern hospital administration principles and technics.

**Chief Public Health Nurse**—FOA Mission, Paramaribo, Surinam. B.S. degree in public health nursing mandatory; M.S. desirable. Minimum five years' experience in public health nursing with part of experience in supervision. Duties: to promote and develop public health nursing in rural health units of the Cooperative Service; to assist in planning and conducting a training program for public health nurses, including auxiliary nursing personnel.

Two-year tour minimum for each. Living allowance applicable. U. S. Public Health Service, Division of International Health, Washington 25, D. C.

## POSITIONS WANTED

**Public Health Veterinarian**—D.V.M., M.S., and M.P.H. Ten years' experience in zoonoses control programs. Speaks English, Portuguese, and Spanish fluently. Will locate in the United States or abroad. **Box V-17,** Employment Service, APHA.

**Public Health Engineer**—Graduate civil engineer with one year of graduate work in sanitary engineering; licensed professional engineer; 19 years' experience in local and state public health engineering and public health administration with three years as assistant director of Division of Local Health Services. Desires position in public health administration or public health engineering. **Box E-30,** Employment Service, APHA.

A noncitizen (Indian) on exchange visitors' visa with M.D. (India) and M.P.H. (University of Calif.) in public health administration and public health education seeks any **position in public health field** in the United States as part of educational exchange fellowship. Available July, 1955, for one year. Bal K. Jerath, M.D., 650 International House, Berkeley, Calif.

**Public Health Laboratory Worker**—Ph.D. Five years' teaching and research experience in clinical parasitology. Two and one-half years as clinical laboratory supervisor. One-year various field work assignments. Desires laboratory position. **Box L-44,** Employment Service, APHA.

**Parasitologist**—M.P.H. desires position in public health, research, or teaching. Five years' experience in public health parasitology and bacteriology. **Box L-45,** Employment Service, APHA.

**Sanitary Engineer**—B.S. and M. C.E., registered. Married, age 39. Fifteen years' varied experience, including state health department and sewage treatment plant operation. Desires permanent position. **Box E-31,** Employment Service, APHA.

**Toxicologist-Pharmacologist** — Ph.D. Seeking position in related fields. Experience includes medical school teaching, research directorship, and industrial toxicologic research. Interests include research, voluntary health and administrative posts. **Box L-46,** Employment Service, APHA.

## Commercial Advertisements

**All communications on the following commercial advertisements should be sent to Burneice Larson, Medical Bureau, Palmolive Building, Chicago 11, Ill.**

### OPPORTUNITIES AVAILABLE

(a) Director, metropolitan health department; population 600,000; medical center; Midwest. (b) Assistant director, university city, 300,000; Southwest. (c) School physician; school population 21,000; staff of 12 nurses; East. (d) Public health physicians, nurses, and sanitarians; foreign assignments. (e) Assistant professor, public health nursing; division of nursing, Eastern college. (f) Coordinator public health nursing and also, director of program in child and maternal care; new program; coeducational college; California. (g) Nursing director and two staff nurses; county health department; excellent medical leadership; California. (h) Director, visiting nurse service sponsored by Junior League; resort city, South. (i) Public health nurse to direct program, public schools, residential town near Chicago. (j) Public health nursing consultants and educators; South America. (k) Senior health inspector; foreign operations, American company. (l) Public health bacteriologist; California. (m) Health educator; county health department; university city, Midwest. (n) Industrial hygienist; leading industrial company; Midwest. (o) Sanitarians and engineers; state health department. Burneice Larson, Medical Bureau, Palmolive Building, Chicago, Ill.

### OPPORTUNITIES WANTED

(a) Public health physician; M.P.H., Johns Hopkins; 11 years, director, metropolitan health department; Diplomate, American Board. (b) Public health nurse; B.S., Ed.D., M.P.H.; seven years' experience as public health nursing administrator and teacher. (c) Health educator; Ed.D., Columbia; six years, assistant professor, health educator; four years, health educator (including mental health) state health department. (d) Statistician; Dr.P.H. (public health research, statistics); 11 years, director, state department, vital and public health statistics. (e) Sanitarian; B.S.; graduate training, environmental sanitation; five years, sanitarian, county health department. Burneice Larson, Medical Bureau, Palmolive Building, Chicago, Ill.

# News from the Field

## WHO News

### Revising List of Causes of Death

An intergovernmental conference convened by WHO met in Paris February 21–26 to complete the Seventh Revision of the International Lists of Diseases and Causes of Death. The recommendations of this group are being considered by WHO's legislative body, the World Health Assembly, meeting in Mexico City in the early weeks of May.

The list, which now numbers 999 categories of diseases and causes of death, was first drawn up in 1855 at the instigation of the International Statistical Congress. The first list to be generally adopted came into use in 1893. Since then six revisions, at approximately 10-year intervals, were made under the auspices of the French government.

With the creation of WHO it was asked to continue the revisions. The work was carried on by the WHO Interim Commission until the first World Health Assembly in 1948. Here, WHO Sanitary Regulation No. 1 was adopted insuring international application of the Classification of Diseases, Injuries, and Causes of Death as a single and comprehensive list.

Since 1948 much progress has been made by WHO member states in improving the collection and interpretation of their statistics on causes of death and nonfatal diseases and injuries. However, in many areas chiefly where health services are in their infancy, even rudimentary statistics are lacking—for 85 per cent of Africa, 70 per cent of Asia, 40 per cent of America.

### Health Conditions in the Americas

Among the preparations made for the XIV Pan American Sanitary Conference in Santiago in October, 1954, were four-year reports (1950–1953 inclusive) on health conditions in each of the American states, as provided in the constitution of the Pan American Sanitary Organization. The data included are as given by the various national health administrations. They include information from the census, from vital statistics and case-reporting systems, as well as descriptions of communicable disease control and sanitation programs, and the number of personnel employed in health programs.

This first of a series of four-year reports is considered an important forward step in providing data for coordinated health planning in the Americas. A more complete and accurate document in preparation for the 1958 Pan American Sanitary Conference is expected as a result of this early experience in developing sound statistical data and standard definitions and procedures.

### Ten Years of Sanitation Progress

In November, 1954, the National Sanitation Foundation celebrated its 10th anniversary. Its history and accomplishments were reviewed in the December, 1954, issue of the foundation's Newsletter. In accordance with the seven-point program of NSF, it held a National Sanitation Clinic in 1948. It has made research grants.

A testing laboratory which is part of the program has made it possible to set up the sanitation "Standards" for the design, manufacture, installation, and official approval of health-related equipment. The Testing Laboratory, which has been separately incorporated, makes available to manufacturers a seal of approval for use on equipment tested by the laboratory and complying with the

appropriate "Standards" developed. A number of educational programs and publications have been developed.

At the present time, the organization of the National Food and Beverage Council, sponsored by NSF, is being completed. Its ultimate objective is to "encourage people to know the value of and to demand quality food, well prepared, tastefully served in a clean and sanitary manner, in clean pleasant surroundings." The joint auspices of the National Restaurant Association, American Hotel Association, state and local agencies, and NSF illustrate the philosophy of across-the-board participation of industry, health agencies, and the public.

Another program being carried on is the Detroit Environmental Health Program in which NSF is cooperating. Based on the experience of the 1948 National Sanitation Clinic, Detroit is holding an annual "Detroit Environmental Health Clinic." The total environment (air, water, food, shelter, wastes, and noise) are considered at these clinics. The city hopes to develop a well rounded preventive program in environmental health. NSF has set up a Detroit office in order to carry out its cooperative effort in the Detroit program.

The National Sanitation Foundation is supported by industry. Henry F. Vaughan, Dr.P.H., is its president; Walter F. Snyder its executive director; and Walter D. Tiedeman, executive director of the Testing Laboratory.

## FDA Civil Defense Foods Advisers

At the request of the Food and Drug Administration, the National Academy of Sciences—National Research Council has established an eight-man FDA Civil Defense Foods Advisory Committee. This committee will study the vulnerability of the food processing and warehousing industries to open attack or sabotage by biologic, chemical, or radiologic agents. It will be concerned also with methods and facilities for sanitizing or decontaminating food plants, equipment, and products in a civil defense emergency. Among the membership of the committee are two Fellows of the American Public Health Association, H. C. Diehl, director, Refrigeration Research Foundation, Colorado Springs, and George W. Putnam, vice president, Creamery Package Manufacturing Company, Chicago. The following members of the Association also serve on the committee: Gail M. Dack, M.D., director, Food Research Institute, University of Chicago; Arnold H. Johnson, Ph.D., president, National Dairy Research Laboratories, Oakdale, N. Y.; and Emil M. Mrak, Ph.D., head, Department of Food Technology, University of California.

## Revised Rheumatic Fever Statement

The American Heart Association has distributed to physicians its revised statement on "Prevention of Rheumatic Fever and Bacterial Endocarditis Through Control of Streptococcal Infections," first issued in 1953. It sums up present knowledge and incorporates new developments in preventive concepts and technics.

Among the new developments in the revised statement for physicians is emphasis on eradicating streptococcal infections from the throat by full doses of penicillin. Intramuscular injections of long-acting benzathine penicillin G are advocated as an effective prophylactic method. In long-term prevention of rheumatic fever recurrences one daily tablet of penicillin has been found adequate. The section on prevention of bacterial endocarditis has been added for the first time.

The statement is part of a vigorous campaign to help communities establish preventive rheumatic fever programs that should eventually result in making the

disease a rare occurrence. To enable intelligent cooperation between the public and the physician, pamphlets, and audiovisual aids are being distributed through local heart associations to parents, teachers, nurses, and social workers.

## AMA Congress on Industrial Health

The 15th Annual Congress on Industrial Health, sponsored by the Council on Industrial Health of the American Medical Association, was held in Washington, D.C., January 25–26. Panel groups discussed Occupational Health—Major Factor in Community Health, Impact of the Atomic Energy Industry on Community Health, and the challenge of Occupational Disability. It was agreed that management, organized labor, medicine, and official agencies each had responsibilities in providing adequate industrial medical services to employed groups. These responsibilities of industrial medicine extend into the home and all departments of community life in addition to the place of employment. William P. Shepard, M.D., chairman of the council, presided at the general session.

An award was presented to Harold A. Vonachen, M.D., president, Peoria Plan for Human Rehabilitation, selected by the President's Committee on Employment of the Physically Handicapped, for his contributions to the welfare and employment of the physically handicapped. A second award, the Distinguished Service Citation, was presented to the Occupational Health Program of the Public Health Service for its contributions to the protection and improvement of worker health.

## 1954 Borden Awards

Among the nine winners of the 1954 Borden Awards, consisting of a gold medal and $1,000, are a Fellow and a member of the American Public Health Association. Karl Meyer, M.D., emeritus director of the Hooper Foundation, University of California, received the eighth annual award of the Association of American Medical Colleges given for outstanding research in medical sciences by a faculty member of an affiliated college. He was honored for his contribution to current knowledge of plague, brucellosis, and the psittacosis group of viruses. Dr. Meyer received the Sedgwick Award of the APHA in 1946 and a Lasker Award in 1951.

Agnes Fay Morgan, Ph.D., emeritus professor of home economics, University of California, a member of the APHA, shared with Arthur H. Smith, Ph.D., head of the Department of Physiological Chemistry, Wayne University College of Medicine, the 11th annual American Institute of Nutrition Award for their studies on the effect of heat on the nutritive value of milk proteins.

Among the other of the 1954 awards related to public health are:

American Chemical Society—Donald V. Josephson, head of the Department of Dairy Science, Pennsylvania State University, for his research on the flavor of milk and its products.

American Home Economics Association—Jane M. Leichsenring, professor of nutrition, University of Minnesota, for original and fundamental research in human nutrition.

American Academy of Pediatrics—Paul György, professor of nutrition in pediatrics, University of Pennsylvania School of Medicine, for his many contributions to the science of nutrition in the field of pediatrics.

## Leukemia Research Grants-in-Aid

The Robert Roesler de Villiers Foundation, established for the purpose of encouraging research directed at finding a means for a preventive measure, control or cure of leukemia, invites qualified investigators to apply for 1955 grants-in-aid in support of research on leukemia. The closing date for applications is August 1, 1955. Grants-in-aid of not more than $1,000 each will be

made beginning September 1, 1955, as recommended by the selection committee. Robert Roesler de Villiers Foundation, Inc., 1172 Park Avenue, New York 28, N. Y.

## Medical Society Educational Fund

The Pennsylvania State Medical Society, through its Commission on Preventive Medicine and Public Health, has established an educational and scientific trust fund. Funds are being solicited to supervise and administer educational and scientific projects in the field of medicine. A first grant of $80,000 has been received from the A. W. Mellon Educational and Charitable Trust.

The first project, according to the commission's chairman, Pascal F. Luchesi, M.D., "will be to assist in the establishment of county health departments in Pennsylvania which will offer better public health services to the citizens of the Commonwealth." The Mellon grant is earmarked to finance a three-year project in postgraduate professional education in public health with special reference to the participation of members of the medical profession in their local health programs.

## PERSONALS

E. C. Anderson, sanitary engineer director and former regional engineer, Public Health Service Regional Office, Dallas, Tex., has been named assistant chief, Radiological Health Branch, Division of Sanitary Engineering Services, Washington, D. C., Headquarters Office, PHS. He has been succeeded in the Dallas Regional Office by sanitary engineer director, E. Carl Warkentin, formerly in charge of the Southwest-Lower Mississippi Drainage Office, Little Rock, Ark.

Major General George E. Armstrong, (MC), Surgeon General, U. S. Army, retires on May 31 to become vice-chancelor, New York University, for medical affairs, New York City.

* Fellow.
† Member.

Ralph C. Barnes,† was inadvertently listed as chief instead of assistant chief, Field Training Section, the Public Health Service's Communicable Disease Center, Atlanta, Ga., in the March Journal.

Colonel Robert J. Benford, (MC), USAF, has succeeded Louis H. Bauer, M.D., first commandant of the U. S. Air Force School of Aviation Medicine and founder of the Aero Medical Association, as editor, Journal of Aviation Medicine.

Kathleen Berresford,† assistant professor of public health nutrition, School of Nutrition, Cornell University, Ithaca, N. Y., has resigned to take advanced graduate work in nutrition and education at the university.

Duane L. Block, M.D., medical director, General Motors Corporation Technical Center, has been appointed physician in charge of medical services at Ford Motor Company's Rough Plant, Dearborn, Mich., succeeding Harley L. Kreiger, M.D., who has been named special assistant to the medical director.

Mathew J. Bonese, D.V.M., formerly in the New Jersey Department of Agriculture, is now public health veterinarian, Southern State Health District, New Jersey Health Department, succeeding R. L. Hectorne,† D.V.M.

James E. Bryan,† administrator, Medical-Surgical Plan of New Jersey, Summit, N. J., has resigned to become a consultant in medical public relations, medical administration, medical publications, and prepayment medical care.

Leo J. Conley, Jr.,† assistant in health education, Bureau of Public Health Information, Connecticut State Health Department, has resigned to become director of health education, Rhode Island Division, American Cancer Society, Providence.

William J. Donald, M.D., health officer of Tuscaloosa and Fayette Counties, Ala., has resigned to become director of county health work, Alabama State Health Department, Montgomery, succeeding Douglas L. Cannon, M.D.,† who is now health officer of Montgomery County, succeeding the late A. H. Graham, M.D.*

Sarah Donovan, R.N., formerly on the staff of the Methodist Hospital School of Nursing, is now a public health nurse in the Peoria (Ill.) Department of Health.

Louise Esch, assistant superintendent, Stanford University Hospitals, San Francisco, has resigned to join the staff of Anthony J. J. Rourke, M.D.,* Hospital Consultant, New Rochelle, N. Y.

Caldwell Esselstyn, M.D.,† director, Rip Van Winkle Clinic, Hudson, N. Y., has been ap-

pointed by Governor Harriman, a member of the State Public Health Council, New York State Health Department.

MARVIN GLASSER,† former biostatistician, Division of Local Health Services, New York State Department of Health, is now on the staff of the Commission on Chronic Illness, Baltimore, Md.

ROGER F. GORDON, former chief, Social Services, Veterans' Administration Regional Office, Newark, N. J., has been appointed mental health consultant for the pilot program in mental health, Fife-Hamill Memorial Health Center, Philadelphia, Pa.

EDWIN L. HARMON, M.D., former director, Grasslands Hospital, Westchester County, N. Y., has joined the staff of the Commission on Chronic Illness, Baltimore, Md.

JOSEPH HIRSH, Ed.D.,* executive secretary, Medical Advisory Board, Hebrew University-Hadassah Medical School, has resigned to become associate professor of preventive and environmental medicine and assistant to Dean MARCUS KOGEL, M.D.,* Albert Einstein College of Medicine, New York, N. Y.

REAR ADMIRAL BARTHOLOMEW W. HOGAN is the new Surgeon General and chief of the U. S. Navy Bureau of Medicine and Surgery, Washington, D. C.

PAUL V. LEMKAU, M.D.,† former professor of public health administration, School of Hygiene and Public Health, Johns Hopkins University, has been named director, Community Mental Health Board, New York, N. Y.

WILLIAM FRED MAYES, M.D.,* director of health, Brookline, Mass., and currently on leave as chief of the Public Health Mission and director of the Health and Sanitation Division, Foreign Operations Agency, Karachi, Pakistan, has been named associate professor of public health practice, Harvard School of Public Health, Boston, Mass.

ROSS T. MCINTIRE, M.D., vice-admiral, USN (Ret.) and former Surgeon General of the Navy, has been appointed executive director, International College of Surgeons, Chicago, Ill.

WILLIAM A. MCINTOSH, M.D.,* former regional medical director (Africa–Asia Minor), Division of Medicine and Public Health, Rockefeller Foundation, and earlier Lorain County health officer, is now chief, Bureau of Local Health Services, Ohio State Health Department, Columbus.

LIEUTENANT COLONEL ALVIN F. MEYER, JR.,* chief, Preventive Medicine Branch, Headquarters Strategic Air Command, Omaha, Neb., has received the U. S. Air Force's Commendation Ribbon for "his outstanding ability, foresight, and initiative in establishing a sound and effective medical and occupational health program for military and civilian personnel of Air Materiel Command."

NORMAN MOORE, M.D.,† director of student health education, Cornell University, Ithaca, N. Y., has been appointed by Governor Harriman, as a member of the State Public Health Council, New York State Health Department.

ALVIN R. MURPHY,† former Knoxville Division Manager, Wallace and Tiernan, has retired and is living in Knoxville, Tenn., Route 12.

J. LOUIS NEFF,* executive director, Texas Division, American Cancer Society, has resigned to return to the Nassau County (N.Y.) Medical Society as its executive secretary.

DANIEL V. NESS, senior sanitary engineer, Bureau of Sanitation, Pennsylvania State Health Department, Harrisburg, has retired following 48 years of service.

RAE NEEDLEMAN,† formerly editor of the Wage Stabilization Board's Monthly Research Report, is now research editor, the Commission on Chronic Illness, Baltimore, Md.

WAYNE RAMSEY, M.D., health officer, Darke County, Ohio, has resigned because of ill health, and the county has entered into a cooperative agreement with Preble County, whose health officer, CARLE W. BEANE, M.D.,† is health officer of the new unit.

GRACE R. RILEY,† former nursing arts instructor, Reading Hospital, is now educational director, Lehigh Valley Public Health Association, Allentown, Pa.

ORVILLE SAUDER, formerly food sanitarian, Peoria (Ill.) Department of Health, is now an associate in the Health Education Division.

A. F. SCHULTZ, M.D., health officer, Sandusky County, is now also health officer of Seneca County, Ohio, following a cooperative agreement between the two counties.

STUART SESSOMS, M.D., former member of the National Cancer Institute General Medicine Branch, has been transferred to the medical staff of the director of the Clinical Center, National Institutes of Health, Public Health Service, Bethesda, Md.

GORDON H. SEGER, Dr.P.H.,* former executive officer, National Cancer Institute, has been appointed chief of extramural programs, National Institute of Neurological Diseases and Blindness, Bethesda, Md., succeeding EDWARD P. OFFUTT, Ph.D.†

TOM D. SPIES, M.D., director, Nutrition Clinic, Hillman Hospital, Birmingham, Ala., was

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* Fellow.
† Member.

granted nonorary membership by the Puerto Rico Medical Association at its recent annual meeting in Santurce for "his interest in the medical problems of Puerto Rico and his valuable contributions to the advancement of medical science."

RICHARD P. SWIGART, formerly on the staff of the National Red Cross, most recently national director of fund raising and earlier administrative director of the national blood program, is now executive director of the National Association for Mental Health, New York, N. Y., succeeding ROBERT M. HEININGER, who resigned to set up a consultant firm to health and welfare agencies on matters of organization, finance, and public relations, to be known as Robert M. Heininger and Associates. Mr. Swigart takes office on August 1.

ROSAMOND TATRO, former social service field representative, Veterans' Administration for New England and New York, has been appointed national medical social consultant, American Cancer Society. Her appointment is a part of the society's effort to strengthen its patient service program in its 60 divisions.

L. HENRY TRIPLETT, formerly with the Peoria Creamery, is now a food sanitarian, Sanitation Division, Peoria (Ill.) Department of Health.

ELLIS S. TISDALE,* sanitary engineer director and regional engineer with the Atlanta Field Office, retires from the Public Health Service on July 1, 1955, and on that date becomes director, Interstate Commission on the Potomac River Basin, Washington, D. C. He will be succeeded in Atlanta by HOWARD CHAPMAN,† formerly head of the Interstate Carrier Program of the Service.

DAVID VAN DER SLICE, M.D.,* director of the School Health Service, Oakland, Calif., is on leave to serve with the Foreign Operations Administration in Paris, France. Under a contract between FOA and the American College of Surgeons, Dr. Van der Slice is setting up screening machinery in selected European countries to nominate physicians for fellowships in public health administration, medicine, and surgery, in the United States.

BRENT A. WELCH, M.D., former health commissioner, Troy-Miami Counties (Ohio), is now commissioner, Wapakoneta-Auglaize County Health Department, a position which had previously been on a part-time basis.

MINA WETZIG, former project writer for the Scientific Management Project, conducted by the Schools of Nursing and Engineering, University of Pittsburgh, has been named a public relations consultant, Bureau of Public Health Education, Pennsylvania State Health Department, Harrisburg.

LEDONIA S. WRIGHT, formerly in the Departments of Clinical Laboratories and Statistics and Epidemiology, Roswell Park Memorial Institute, has been appointed public health educator, Buffalo-Erie County (N.Y.) Health Department.

WALDEMAR J. A. WICKMAN, M.D.,† former chief of the Outpatient Branch, has been appointed assistant chief, Division of Hospitals, Public Health Service, Washington, D. C., succeeding CLIFTON K. HIMMELSBACH, M.D., recently appointed chief of the division.

MAX WILCOMB, assigned as biologist to the Oklahoma State Department of Health since September, 1954, has returned to the Public Health Service as senior assistant scientist, Technology Branch, Communicable Disease Center, Public Health Service, Prestonsburg, Ky.

MARK V. ZIEGLER, M.D.,† a retired Public Health Service officer and recently chief, Bureau of Medical Services, Maryland Department of Health, has been named medical director, Region 6, Pennsylvania Department of Health, with headquarters in Reading.

ELIZABETH ZACHA, former public health nurse, San Antonio, Tex., is now public health nurse, Alaska Department of Health, stationed in Bethel and serving 13 villages.

DAVID ZACKS, M.D., chief of clinics, Division of Tuberculosis and Sanatoria, Massachusetts Department of Public Health, Boston, has retired after 30 years of service.

## DEATHS

LAURA BLACKBURN, state consultant nurse in midwifery, Division of Maternal and Child Health, South Carolina State Board of Health (Columbia) and a member of the South Carolina Public Health Association on February 13.

ERNST P. BOAS, M.D., M.A.,† New York, N. Y., internationally known authority on heart and chronic diseases and champion for many years of better care and more adequate facilities for the chronically ill, on March 9 at the age of 64 (Medical Care Section).

ROBERT P. FARRELL, M.S.,* chief sanitary engineer, State Department of Health, Nashville, Tenn. (Engineering Section).

CROZIER S. HART, M.D.,† district health officer, Las Animas-Huerfano Counties, Colo. (Health Officers Section).

PHILIP M. HUTCHINSON,† hospital administrative officer, Alaska Native Service Hospital, Anchorage, Alaska, on February 13 (Medical Care Section).

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* Fellow.
† Member.

BRUNO LA HAYE, D.P.H.,† Ministry of Health, Quebec, Canada (Health Officers Section).

JOSEPHINE B. NEAL, M.D., for many years associate director, Bureau of Laboratories, New York City Department of Health and winner of an Elizabeth Blackwell Citation in 1953, on March 19.

PEEL M. PAYNE, M.D.,* of Asherton, Tex. (Health Officers Section).

F. D. PEASE, M.D., for many years health officer of Missoula, Mont., on January 19 at the age of 83.

DR. EDWARD W. ROBBINS,† pharmacologist and biochemist of Philadelphia Pa. (Maternal and Child Health Section).

JOHN J. SUTTER, M.D.,* health commissioner, Lakeside (Ohio) Department of Health (Health Officers Section).

J. HART TOLAND, M.D., M.P.H.,† special assistant, Division of Medical Services, Board of Public Education, Philadelphia, Pa. (School Health Section).

D. E. W. WENSTRAND, M.D.,† formerly medical director, Northwestern Mutual Life Insurance Company, Milwaukee, Wis., but recently residing in Tryon, N. C. Unaffiliated).

## CONFERENCES AND DATES

**American Public Health Association 83rd Annual Meeting. Kansas City, Mo., November 14–18.**

**State and Regional Public Health Meetings:**

Idaho Public Health Association. Shore Lodge Hotel, McCall, Idaho. May 7–8.

Louisiana Public Health Association with Southern Branch, APHA. New Orleans, La. Jung Hotel. May 9–12.

Michigan Public Health Association. Grand Rapids, Mich. May 18–20.

Missouri Public Health Association. Sheraton Hotel, St. Louis, Mo. May 12–14.

Montana Public Health Association. Missoula, Mont. June 3–4.

New England Health Institute. Colby College, Waterville, Me. August 30–Sept. 1.

New York State Annual Health Conference. Lake Placid, N. Y. June 6–9.

Pennsylvania Public Health Association. Pennsylvania State University, State College, Pa. August 15–18.

South Carolina Public Health Association. Clemson House, Clemson, S. C. May 19–21.

Southern Branch, APHA. New Orleans, La. Jung Hotel. May 9–12.

United States-Mexico Border Public Health Association. Hotel del Bosque, Mexico City, Mexico. May 6–9.

**Meetings of Other Organizations Coming in May, June, and July:**

Adirondack Workshop (Community Chest and Councils of America) "Communications in Social Welfare." Silver Bay, Lake George, N. Y. July 7–12.

Air Pollution Control Association. Detroit, Mich. May 22–26.

American Association of Medical Social Workers. San Francisco, Calif. May 31.

American Diabetes Association. Atlantic City, N. J. June 13–15.

American Hearing Society. Hotel Morrison, Chicago, Ill. June 12–14.

American Home Economics Association. Minneapolis, Minn. June 28–July 1.

American Medical Association. Atlantic City, N. J. June 6–10.

American National Red Cross. Atlantic City, N. J. June 13–15.

American Physical Therapy Association. Hotel Jefferson, St. Louis, Mo. June 20–24.

American Psychiatric Association. Atlantic City, N. J. May 9–13.

American Water Works Association. Chicago, Ill. June 12–17.

British Medical Association. London, England, June 1–4.

Canadian and British Medical Associations. Joint Meeting. Toronto, Canada. June 20–22.

Central Atlantic States Association of Food and Drug Officials. Atlantic City, N. J. June 1–3.

National Association for the Prevention of Tuberculosis. Fourth Commonwealth Health and Tuberculosis Conference. Royal Festival Hall, London, England. June 21–25.

National Conference of Social Work. San Francisco, Calif. May 29–June 3.

National League for Nursing. Biennial Convention. St. Louis, Mo. May 2–6.

National Tuberculosis Association. Milwaukee, Wis. May 23–27.

Planned Parenthood Federation of America. Waldorf-Astoria Hotel, New York, N. Y. May 5–6.

Purdue Industrial Waste Conference. Purdue Memorial Union, Lafayette, Ind. May 9–11.

Society of American Bacteriologists. New York, N. Y. May 8–13.

U. S. Conference of Mayors. Waldorf-Astoria Hotel, New York, N. Y. May 19–21.

World Health Assembly (8th). World Health Organization. Mexico City, Mexico. May 10.

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* Fellow.
† Member.

The American Public Health Association acknowledges with deep appreciation its indebtedness to these Sustaining Members whose annual dues help support its general program

## *Sustaining Members*

Amalgamated Laundry Workers Health Center, Inc., New York, N. Y.
American Aerovap, Inc., New York, N. Y.
American Association of Medical Social Workers, Washington, D. C.
American Bottlers of Carbonated Beverages, Washington, D. C.
American Can Company, New York, N. Y.
Association for the Aid of Crippled Children, New York, N. Y.
George Baehr, M.D., New York, N. Y.
Borden Company, New York, N. Y.
Chlorine Institute, Inc., New York, N. Y.
Congress of Industrial Organizations, Washington, D. C.
Difco Laboratories, Detroit, Mich.
Diversey Corporation, Chicago, Ill.
Equitable Life Assurance Society of the United States, New York, N. Y.
Grand Concourse Medical Group, New York, N. Y.
John Hancock Mutual Life Insurance Company, Boston, Mass.
Hellige, Inc., Garden City, N. Y.
Hoffmann-La Roche, Inc., Nutley, N. J.
Holland-Rantos Company, Inc., New York, N. Y.
International Association of Ice Cream Manufacturers, Washington, D. C.
International Association of Machinists, Washington, D. C.
International Equipment Company, Boston, Mass.
Lederle Laboratories Division, American Cyanamid Co., New York, N. Y.
Liberty Mutual Insurance Companies, Boston, Mass.
Licensed Beverage Industries, Inc., New York, N. Y.
Life Insurance Company of Virginia, Richmond, Va.
Lily-Tulip Cup Corporation, New York, N. Y.
Merck & Company, Inc., Rahway, N. J.
M & R Laboratories, Columbus, Ohio
Metropolitan Life Insurance Company, New York, N. Y.
Montefiore Hospital Medical Group, New York, N. Y.
National Dairy Products Corporation, New York, N. Y.
National Farmers Union, Denver, Colo.
New York Hotel Trades Council and Hotel Association Health Center, Inc., New York, N. Y.
Oval Wood Dish Corp., Tupper Lake, N. Y.
Owens-Illinois Glass Company, Toledo, Ohio
Prudential Insurance Company of America, Newark, N. J.
Rip Van Winkle Clinic, Hudson, N. Y.
Ross-Loos Medical Group, Los Angeles, Calif.
St. Louis Labor Health Institute, St. Louis, Mo.
Sealright Company, Inc., Fulton, N. Y.
Sharp and Dohme, Inc., Glenolden, Pa.
Sidney Hillman Health Center, New York, N. Y.
E. R. Squibb and Sons, New York, N. Y.
Steiner Sales Company, Chicago, Ill.
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